CHUNG & VANDER DOELEN
ENGINEERING LTD.

HYDROGEOLOGICAL INVESTIGATION
PROPOSED 13-LOT SUBDIVISION
Part Lot 13, Conc 2, Town of Erin
Ospringe, Ontario

SUBMITTED TO:
Spirit of Pentecost
c/o Mr. Terrell Heard
3029 Clayhill Road, PO Box 20059
Mississauga, Ontario
N0B 1T0

FILE NO / H16051 / February 27 2019

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

February 27, 2019
FILE NO.: H16051

Spirit of Pentecost
c/o Mr. Terrell Heard
3029 Clayhill Road, PO Box 20059
Mississauga, Ontario
N0B 1T0

Dear Mr. Heard:

RE: HYDROGEOLOGICAL INVESTIGATION
PROPOSED 13-LOT RESIDENTIAL SUBDIVISION
Part Lot 13, Conc 2, Town of Erin (Ospringe)

This report summarizes the results of a hydrogeological investigation completed in support of a proposed 13-lot residential subdivision located in the hamlet of Ospringe, at Part Lot 13, Concession 2, Town of Erin.

The subdivision lots would be supplied with individual water supply wells and wastewater treatment systems. This investigation characterizes the hydrogeological setting and assesses the feasibility and potential impacts of these proposed individual services.

If you have any questions or concerns regarding the report, please contact the undersigned.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

S. Anderson.

William (Sandy) Anderson, M.Sc., P.Eng.
Senior Hydrogeologist and Engineer

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1.0 INTRODUCTION

This report presents the findings of a hydrogeological investigation of a proposed 13-lot residential subdivision on a 3.62-hectare property in the hamlet of Ospringe (Figure 1). The legal description of the subject property is Part of Lot 13, Concession 2, Town of Erin (formerly Township of Erin), County of Wellington.

The objectives of the investigation are as follows:

1. To characterize the hydrogeological setting at the site.
2. To assess the site conditions in relation to water supply and sewage servicing requirements and make recommendations in this regard.
3. To identify the groundwater and surface water receptors, evaluate the potential impacts to these receptors from the proposed water taking and sewage effluent, and make recommendations to address these impacts, where appropriate.
4. To identify potential opportunities, if any, for enhancing groundwater recharge during post-development.

2.0 INVESTIGATION SCOPE

2.1 BACKGROUND DATA REVIEW

The following background information and reports (Section 6.0 lists the specific reports) have been considered as part of this investigation:

- Regional-scale topographic mapping (Figure 1) and detailed site topographic mapping provided by IBI Group (Figure 5).
- Quaternary (surficial overburden) and Paleozoic (bedrock) geology mapping for the area (Figures 2 and 3).
- Water Well Records (Appendix D).
- The hydrogeological investigation report for the recently-approved adjacent 60-lot Thomasfield development.
- The supporting geotechnical, sewage system, stormwater management and functional servicing reports for the subject development.

2.2 WATER WELL INVENTORY

CVD completed an inventory of private wells within 100 m of the subject property in April and May, 2018. The data from the inventory is used to support the water servicing for the subject property and to identify potential groundwater receptors surrounding the property. Figure 4 identifies all private wells within the inventory area, including those residences with a confirmed well record, those with an unconfirmed well location and includes both drilled and shallow dug wells.

2.3 BOREHOLE DRILLING & MONITORING WELL INSTALLATION

Borehole drilling and monitoring well installation were completed on May 3, 2018 at six locations (BH1 to BH6, Figure 5) to depths ranging from 5 to 7 m. These boreholes/wells were drilled/installed to investigate the shallow subsurface geological and water table conditions at the property.

Standard hollow stem auger (HSA) drilling and installation methods were employed using a track-mounted auger rig. No water was introduced during drilling. Five representative soil samples were later analysed for grain size distribution at the CVD soils laboratory. Appendix C provides borehole logs, well installation details and grain size analysis results.

On May 11, 2018, each monitoring well was developed using Waterra polyethylene tubing and foot-valve hand pumps and surveyed for elevation and location by CVD and referenced to a manhole lid located along Wellington Road 24 (geodetic elevation 414.48 mASL).

2.4 WATER LEVEL MONITORING

Water level monitoring was conducted on May 11 and July 31, 2018. Table 1 provides a summary of the groundwater levels, calculated elevations and the fluctuations between these spring and summer events.

2.5 WELL RESPONSE TESTING

The hydraulic conductivity (or permeability) of the surficial materials at the water table were estimated using 'rising-head' well response tests completed on May 11, 2018. The data were analyzed using Aquifer Test software and the results are provided in Appendix E.

2.6 WATER QUALITY TESTING

Shallow groundwater samples were collected on May 11, 2018 from monitoring wells BH1, BH2, BH4 and BH5. The samples were analysed for chloride and nitrate by ALS Laboratory Group and the analytical report is provided in Appendix E.

3.0 SITE CHARACTERIZATION

3.1 TOPOGRAPHY & DRAINAGE

Regional topography and drainage features are shown in Figure 1. The property is situated on top of and down the eastern flank of a 3-kilometer-long hill, oriented northwest-to-southeast. The peak elevation of the hill (about 419 mASL) is located immediately southwest of the property and the hill is fringed by the Eramosa River valley to the northeast, east and southeast at elevations below 380 mASL. The southerly-flowing Eramosa River, located about 1 to 1.5 km to the northeast and southeast, is the primary drainage feature in the area and is the ultimate receiver of surface water runoff from the property.

Site topography is gently rolling (Figures 5 and 6) and the highest site elevation is about 418 mASL along the southwest property boundary. From the highest point, the majority of the property slopes steadily eastward to a low of about 408 mASL in the easternmost corner. A small portion of the property, at the back of Lots 5, 6 and 7 in the westernmost corner, slopes northward to an elevation of about 314.5 mASL at the boundary.

There are no permanent water courses on the property. As a result, drainage is expected to occur primarily as sheet runoff, following topography mostly to the east and with a small portion moving off to the north from the western corner. The eastward drainage eventually follows roadside ditches along Co. Rd. 24 to a small tributary of the Eramosa River where it crosses beneath the road (Figure 1). The northward drainage moves toward the same tributary, but in this case, where it starts about 250 m northwest of the property (Figure 1).

3.2 GEOLOGIC SETTING

3.2.1 Overburden

Surface geological mapping for the area (by Karrow, 1968) is presented in Figure 2. The hill on which the property is located is one of a series of elongate hills, oriented northwest to southeast across the area, that are together known as the Guelph Drumlin Field. The mapping indicates that these drumlins and much of the intervening lands are underlain by the Wentworth Till (Deposit 5, Figure 2). However, in a later geological publication on the Cambridge Area (1987), Karrow determined that the Wentworth Till actually ends about 4 kilometers to the southeast at the Paris Moraine and that the till across this particular area is actually the older Port Stanley Till, a sandy silt to silt till. The mapping also indicates that the Eramosa River valley is underlain by a peat, muck and marl swamp (Deposit 10, Figure 2) and fringed by surficial outwash gravel (Deposit 7, Figure 2).

The site borehole data (Appendix C) indicate the property is underlain by deposits that vary from the expected Port Stanley Till mapped by Karrow and which is present throughout the adjacent Thomasfield property (GM BluePlan, 2016). The site is mostly underlain by an inter-layered ‘sand and silt’ to ‘sandy silt’ deposit at five locations (BH1, BH2, BH3, BH4 and BH6), with occasional minor inter-layers of fine sand

(BH3) or sand and gravel (BH1). Sandy silt till was encountered at BH5 throughout the 7-m drilling depth and a substantial 4-m layer of sandy silt till was encountered at BH2 between layers of sand and silt. The grain size analyses of some of the sand/silt samples (e.g., BH2 at 1 m and BH3 at 1 m) show a grain size distribution pattern that is very similar to the sandy silt till on site (e.g., BH5 at 1 m). On this basis, it is interpreted that the sand/silt deposits at the site are localized outwash, derived from the predominant sandy silt till deposit, but which are not sufficiently extensive to have been reflected in Karrow's mapping.

Information on the deeper overburden deposits is available from local water well records. Table 2 lists the overburden thicknesses from each well record within 100 m of the property; the thicknesses ranging from 23 to 49 m (75 to 162 feet), owing in part to ground topographic differences. The vast majority of the driller's descriptions of the overburden materials in the area are considered to be low-permeability till or till-like deposits (e.g., clay, clay & stones, clay & boulders, clay & gravel, etc.). None of the well records in the inventory area indicate the presence of any deep granular deposits above bedrock.

3.2.2 Bedrock

The Paleozoic Geology mapping for the area (Figure 3) indicates the property is located near an approximate boundary between underlying bedrock formations; with the younger Guelph Formation tan thinly-bedded dolostone to the northwest of the property and the older underlying Amabel Formation massive cryptocrystalline grey dolostone (with upper Eramosa Member dark brown shaley dolostone) to the southeast. Most local well records confirm the uppermost bedrock to be a 'brown' dolostone (or limestone, as drillers refer to it) on the order of 3 to 20 m thickness, and an underlying grey dolostone. The brown dolostone could be either the Eramosa Member or a thin portion of the Guelph Formation. The thickness of the Amabel Formation in this area (including the Eramosa and a possible small layer of the Guelph) is on the order of about 90 m (300 feet) (Telford, 1973).

The elevation of the bedrock surface beneath the property is typically in the 370 to 380 mASL range, based on the well record data.

3.3 HYDROGEOLOGIC SETTING

The hydrogeological setting at the property has three primary components:

- The ***shallow water table zone*** within the surficial silt/sand deposit and the upper weathered portion of the sandy silt till deposit.
- The low-permeability till ***aquitard*** that separates the water table zone and the deep regional aquifer.
- The ***deep regional aquifer*** within in the dolostone bedrock formations.

3.3.1 Water Table Configuration & Shallow Groundwater Flow

Figures 6 and 7 present, respectively, the water level elevation data from May 11 and July 31, 2018 monitoring rounds and interpreted water table contours using these data. These two sets of contours reflect the spring 'high' and summer 'low' water table configurations.

In general, the water table configuration mimics topography and the pattern of contours is essentially the same during both the high and low water table conditions. Shallow groundwater is directed northward in the southwestern 'upgradient' part of the property across lots 3, 4 and 5. Flow then splits, mimicking topography; a small portion continuing across Lots 6 and 7 then northward from the site, and a larger portion bending eastward past lots 1, 2, and 8 to 13.

Shallow groundwater flow velocity is calculated using the Darcy Equation, as follows:

$$V = k\,i / n$$

where
- V = average linear groundwater flow velocity [m/s]
- k = *horizontal* hydraulic conductivity of soil media [m/s]
- i = *horizontal* hydraulic gradient [m/m]
- n = effective porosity of the media [unitless]

The *horizontal* hydraulic conductivity values for the water table zone deposits, based on the five well response test analyses, fall within about one order of magnitude, from 1.5×10^{-7} to 1.5×10^{-6} m/s (Appendix E). These values are consistent with literature values from Freeze and Cherry (1979) for the upper end of glacial till and the lower end of silty sands. The *horizontal* hydraulic gradient (or water table slope) is calculated to be in the 0.025 to 0.035 m/m range, based on the water table contours in Figures 6 and 7. Using these values and assuming a typical effective porosity of 0.3, the *horizontal* groundwater flow velocity through the water table zone is calculated to be in the 0.4 to 5.5-m/yr range, which is quite modest and reflects the very high silt content. For an approximately 7-m thick upper water table zone, moving across the approximately 150-m property width (perpendicular to flow), the shallow groundwater flux (or flow volume) is calculated to be in the 125 to 1750 m^3/yr range.

3.3.2 Shallow Groundwater Quality

The nitrate and chloride concentrations from the four shallow groundwater samples have respective ranges of 0.2 to 4.9 mg/L and 3.1 to 19.1 mg/L. The average nitrate concentration is 3.1 mg/L and this suggests there are some modest background nitrate sources from on-site and/or upgradient agricultural use and/or septic effluent.

3.3.3 Till Aquitard & Aquifer Protection

The well record data indicate there is a till aquitard beneath the site and surrounding lands with a substantial thickness of <u>at least</u> 28 m (<u>conservatively</u> based on a high bedrock elevation of 380 mASL and a low ground elevation of 408 mASL) and ranging up to about 50 m. The *vertical* hydraulic conductivity of the un-weathered sandy silt till aquitard is expected to be no greater than about $1x10^{-8}$ m/s (or about one order of magnitude lower than the lowest horizontal hydraulic conductivity from the water table zone). The large thickness and low permeability of this aquitard combine to provide a substantial degree of protection from possible surface contaminants moving to the bedrock aquifer.

3.3.4 Groundwater Recharge

The pre-development rate of groundwater recharge at the property has been estimated using the water balance method of Thornthwaite and Mather (1957). This method utilizes precipitation and temperature data to provide monthly approximations of the two primary water balance components: evapotranspiration and water surplus. Surplus is the amount of runoff plus the percolation plus the change in soil moisture storage and is equivalent to the precipitation minus the evapotranspiration. This water balance method is cited in the MECP document 'Hydrogeological Technical Information Requirements For Land Development Applications' (April, 1995) for use in the evaluation of septic system impact. The latter document also provides a method, based on site soil, vegetative cover and slope conditions, for estimating the proportions of the surplus that ultimately becomes runoff vs. groundwater recharge.

Appendix G provides water balance calculations using the climate 'Normals' from the Waterloo Wellington weather station, a mix of cultivated land and grass vegetation and a sand/silt loam soil condition. Results indicate a water balance of about 0.37 m/yr. Using applicable infiltration factors for topography, soil type and vegetative cover, as recommended in the 1995 technical document, the proportion of surplus which becomes recharge (0.24 m/yr or 8,680 m^3/yr) has been estimated for the site and this calculation is also summarized in Appendix G.

3.3.5 Bedrock Aquifer Groundwater Flow

Figure 4 presents September 17, 2015 bedrock aquifer potentiometric elevations for the three test wells drilled on the adjacent Thomasfield Development property (GM BluePlan, 2016). Based on these data, groundwater flow in the bedrock aquifer beneath the Thomasfield property is interpreted to be eastward (Figure 4), which is consistent with flow toward the regional discharge feature, the Eramosa River. The River and valley deposits are likely to be hydraulically connected to the bedrock aquifer. Based on the proximity and similar setting, it is interpreted that the deep groundwater flow beneath the subject property is similarly directed eastward (or perhaps slightly northeastward) toward the River.

3.3.6 Groundwater Use

Sixteen (16) of the twenty-three (23) wells shown in the 100-m well inventory area (Table 2 and Figure 4) are bedrock aquifer wells, including two of the bedrock aquifer wells drilled for the adjacent Thomasfield Development, and the remaining seven (7) wells are shallow dug wells.

The Guelph-Amabel bedrock aquifer is renowned in Southern Ontario as a very reliable water supply resource, supporting aquifer yields upwards of 250 gallons/minute for many municipalities in the area (e.g., Guelph, Fergus, Erin and Cambridge). This is why most private wells in the area are drilled to this aquifer and there is rarely any problem whatsoever in obtaining an adequate supply for an individual residence. Table 2 summarizes the test pumping rates (ranging from 7 to 90 gallons/minute and averaging 18 gpm) for the fifteen wells that were tested within the inventory area. The high end of this range and the average are considerably higher than typical test rates for domestic wells. The specific capacities of the wells in the area are also summarized in Table 2 and the average is approximately 2 gpm/ft, which is considered excellent for domestic wells and suggests very little drawdown occurs during typical pumping durations for domestic wells.

The Guelph-Amabel aquifer is also renowned for excellent natural water quality, albeit typically hard and occasionally containing elevated but treatable iron or manganese concentrations. The water sample results from the bedrock aquifer test wells on the adjacent Thomasfield development (TW1, TW2, TW3) confirm the excellent water quality (Appendix F, GM BluePlan Table 4), with very low salts (<2 mg/L chloride, <16 mg/L sodium, and <10 mg/L sulphate), negligible nitrate (<0.1 mg/L), elevated but treatable hardness (160-180 mg/L), and occasionally modestly elevated manganese (0.01 to 0.2 mg/L).

There are well records for two of the shallow dug wells (6706466 and 6706697) and both indicate the wells were dug (or bored) into an 'apparent' surficial sand deposit. One of the two was not subjected to a pumping test by the driller and the other was pumped at a low rate of 2 gpm. Discussions with several of the neighbouring residents indicated that most dug wells provide insufficient water, causing some owners to replace their dug wells with drilled wells for this reason (e.g. 6713028, 6704436 and NR4). It is also noted that well 6706697 is actually located on the development property (Figure 4) and is used by an adjacent residence through an agreement with a previous owner of the development property.

Based on the apparent limited yield and the susceptibility to surface contamination, it is concluded that the water table "aquifer" is a tenuous water supply resource.

4.0 SITE SERVICING REQUIREMENTS & IMPACT ASSESSMENT

4.1 WASTEWATER SYSTEMS & POTENTIAL IMPACT OF EFFLUENT

The design of the proposed wastewater treatment systems and leaching beds is addressed under separate cover (Wastewater Servicing Assessment, Flowspec Engineering, Feb 2019). The systems proposed will be OBC-approved tertiary systems capable of 30% nitrogen removal and the leaching beds would be located in the backyard of each lot.

Based on the setting described in Section 3.0 of this report, the following hydrogeological receptors are identified for evaluation regarding the potential impact from septic effluent:

- The shallow groundwater that discharges to surface water (Eramosa River and tributary),
- The shallow water table aquifer that is used for water supply purposes, and
- The deep bedrock aquifer that is used for water supply purposes.

General impact from septic effluent is evaluated in terms of nitrate loading and compared to the Ontario Drinking Water Standard of 10 mg/L. Table 4 summarizes the calculated nitrate loading for the property, using the conservative method recommended by MECP (MOE Technical Guideline For Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment, 1996). This calculation utilizes the following assumptions:

- An annual groundwater recharge rate of 0.24 m/yr, based on the pre-development water balance calculations summarized in Section 3.3.4, and assuming post-development stormwater management will maintain this recharge rate by using a rural open-ditch road profile and SWM pond, where recharge would be enhanced.
- 1000 L/day effluent flow per household (Guideline recommended value)
- 40 g/day effluent mass per household (Guideline recommended value) reduced to 28 g/day using OBC-approved tertiary wastewater treatment systems that are capable of 30% nitrogen reduction.
- Dilution from recharge only (i.e., conservatively assuming no denitrification and no groundwater crossflow)

The resultant conservative nitrate loading is calculated to be 9.9 mg/L, which is below the typical standard for comparison of 10 mg/L. Given the conservative nature of the calculation, this loading value is considered to be protective of the shallow groundwater in the context of potential impact to groundwater discharge to off-site surface water resources. It is also expected to be sufficiently protective of potential impact to the deep bedrock aquifer, which has a high degree of hydraulic isolation from the intervening thick till aquitard.

Five shallow supply wells (6706466, 6706697, NR1, NR2 and NR3; Figure 4) are located in the immediate downgradient flow path from some of the proposed septic systems. The average nitrate loading, even with the recommended 30% nitrate-reducing systems, is not considered to be sufficiently protective of these shallow supplies because of the potential that individual effluent plumes could move over a relatively short distance toward a specific well. It is therefore recommended that one of the following two options be implemented to address the risk:

1. Further improve sewage treatment to OBC 75% nitrate reducing systems and provide disinfection prior to discharge to the leaching bed to remove health-related bacteria.
2. Decommission the five dug wells and provide each of the three residences and the church with a new secure bedrock aquifer supply well.

While both options are feasible to address the potential for impact, Option 1 would require an on-going monitoring program to ensure the treatment systems continue to be effective and that the dug well quality has not been adversely affected. Option 2 is preferred since it would not require a monitoring program and the owners would have much better and safer water supplies.

4.2 WATER SUPPLY & POTENTIAL IMPACT OF WATER TAKING

Individual bedrock aquifer supply wells are recommended for each of the thirteen development lots. It is recommended the wells be located in the front yards of each lot (Figure 8), leaving the larger area in

the backyards for leaching beds and amenities.
As described in Section 3.3.6, establishing adequate domestic supplies from this aquifer is not expected to be a problem whatsoever, given the numerous successful local bedrock wells with relatively high yields and specific capacities.

To evaluate the potential for mutual interference between supply wells, short-term and long-term aquifer drawdown at a representative well near the centre of the property (Lot 9) has been modelled using the Cooper and Jacob modified non-equilibrium equation:

$$s = 0.183\ Q/T \log (2.25\ Tt / (r2S))$$

where:
- s = the water level drawdown, in m, at a specified distance from a pumping well
- Q = the constant pumping rate, in m^3/day, from a pumping well
- T = the aquifer transmissivity, in m^2/day
- S = the aquifer storativity (dimensionless)
- r = the radial distance, in m, from a pumping well to the specified location
- t = the time since pumping started

Representative values of T (1.0×10^{-3} m^2/s) and S (1.0×10^{-4} unitless) used in the calculations were from the 7.6-hour pumping tests of wells TW1 and TW2 located on the adjacent Thomasfield Development (see GM BluePlan Table 6, Appendix E). GM BluePlan 'monitoring well' analyses values were used (i.e., TW1 drawdown from pumping TW2, and vice versa) since these are reflective of a large portion of the aquifer based on the 225-m distance between the two wells.

The model results are summarized in Table 3. The cumulative drawdown at the representative well (Lot 9) from simultaneous pumping of all thirteen development wells, plus the four new wells recommended for neighbouring lots (Figure 8), has been calculated for the following scenarios:

- 1-day, 1-year and 5-year pumping durations at a conservatively high 'average-day' pumping rate of 1.5 m^3/day (about 1 L/min).
- 2-hour pumping duration at a conservatively high 'peak-demand' pumping rate of 18 m^3/day (about 12.5 L/min), to reflect an extreme worst-case scenario where all wells obtain the daily demand volume (1.5 m^3) in a much shorter 2-hour period.

Not surprisingly, based on the high aquifer transmissivity and storativity values, the cumulative drawdown at the representative well (Lot 9) is very modest, both in the short-term peak-demand scenario (1.16 m in 2 hours) and long-term average-day scenario (0.33 m after 5 years). Based on this analysis, it is concluded that the additional seventeen wells will not cause significant aquifer drawdown, nor will there be interference with existing neighbouring wells and new development wells.

In respect to water quality, the data from the neighbouring test wells on the adjacent Thomasfield development (Appendix F, GM BluePlan Table 4), as described in Section 3.3.6, confirm the excellent water quality with very low salts, negligible nitrate, and elevated but treatable hardness and occasionally manganese.

4.3 POTENTIAL IMPACT TO GROUNDWATER RECHARGE

Based on the surficial silty/sandy setting and the positive recharge conditions at the property, as described in Section 3.0 of this report, along with the rural road cross-section, it is expected that the pre-development groundwater recharge will be maintained during post-development due to enhanced recharge along the roadside ditches and SWM pond. In addition, the majority of the water taking from the deep aquifer will be recharged (via the leaching beds at 4745 m^3/yr) into the shallow groundwater flow system. As a result, a large increase in recharge to the shallow water table is expected at the property.

4.4 ASSESSMENT OF WATER TABLE & GRADING DESIGN

The grading design for the development is provided in the functional servicing report by IBI Group (2019). The IBI grading plan is the base map in Figure 5 and it includes finished elevations along the roadside ditches, in the SWM pond, and across the development lots (e.g., along sideyard swales, in the front yards and at the central building footprints). This grading plan has been reviewed and, in all cases, the seasonally 'high' water table (i.e., Figure 6) is located below all proposed surface grades, including the roadside ditches and SWM Pond. In addition, the central building footprint grades have been set to provide at least a 3.3 m separation distance from the 'high' water table. Although specific building types, precise locations and main floor grades have not been set at this point, the proposed soil grades will allow basement floor separation distances of at least 0.5 m from the 'high' water table to be achieved. The backyard leaching beds, which will partially raised, will be easily kept more than the required 1.0 m from the 'high' water table.

5.0 CONCLUSIONS & RECOMMENDATIONS

Based on the results of the hydrogeological investigation described in this report, the following conclusions and recommendations are provided.

1. The subject property is underlain by moderate-permeability sand/silt and sand/silt till deposits and with a shallow water table varying in depth from about 0.6 to 3.2 m depending on location and season. Shallow groundwater flow beneath the property mimics topography, moving eastward and northward across and away from the property. The soils support positive recharge conditions and support construction of backyard leaching beds for the proposed individual on-site tertiary wastewater treatment systems.

2. A 28 to 50-m thick low-permeability till aquitard extends beneath the property, overlying a permeable dolostone bedrock aquifer that is renowned for its water supply capability. The thickness and low permeability of the aquitard combine to provide substantial hydraulic separation between the water table receiving sewage effluent and the bedrock aquifer; and thus substantial water quality protection is afforded to the aquifer.

3. Data from local well records and pumping tests of wells located on an adjacent development property confirm the viability of the dolostone bedrock to support individual bedrock supply

wells for the development, without concern for interference with existing neighbouring wells or the future wells on the development property. The wells are recommended for the front yards. Treatment for hardness and manganese (if present) is a viable option to future owners, if desired.

4. Tertiary wastewater treatment systems, designed in accordance with the Ontario Building Code and capable of a minimum of 30% nitrate removal, are recommended for the development lots. These will provide an improved level of treatment, for nitrate and other parameters, compared to conventional systems and provide good general protection of shallow groundwater and surface water resources (i.e., by maintaining average nitrate loading below 10 mg/L).

5. There are three residences and a church located directly downgradient from the development that are currently serviced by shallow wells. These supplies are already expected to be tenuous based on the modest yields available from the water table zone and the susceptibility of shallow groundwater to contamination (e.g., from septic effluent and agriculture). Two options have been identified to address the increased risk for contamination of these wells from the additional effluent loading at the development property. Option 1 would consist of increasing the level of nitrate removal to 75% in the proposed treatment systems and including bacterial disinfection. This option would require an on-going monitoring program to ensure its effectiveness. Option 2 would decommission the dug wells and provide the three residences and church with new individual bedrock aquifer supply wells. Both options are technically viable, however, Option 2 is preferred since it would not require a monitoring program and the neighbouring owners would have much better and safer water supplies.

6. To maintain (or enhance) groundwater recharge during post development, it is recommended that grassed swales/ditches be utilized along roadways and lot lines to promote infiltration of runoff. This recommendation has been incorporated into the site design.

7. The site grading plan design provides adequate separation distance from the seasonally high water table and the future buildings, leaching beds, roadside ditches and the SWM pond.

Respectfully submitted,
CHUNG & VANDER DOELEN ENGINEERING LTD.

LICENSED PROFESSIONAL ENGINEER
W.A.A.
W. A. ANDERSON
Feb 27 2019
PROVINCE OF ONTARIO

S. Anderson.

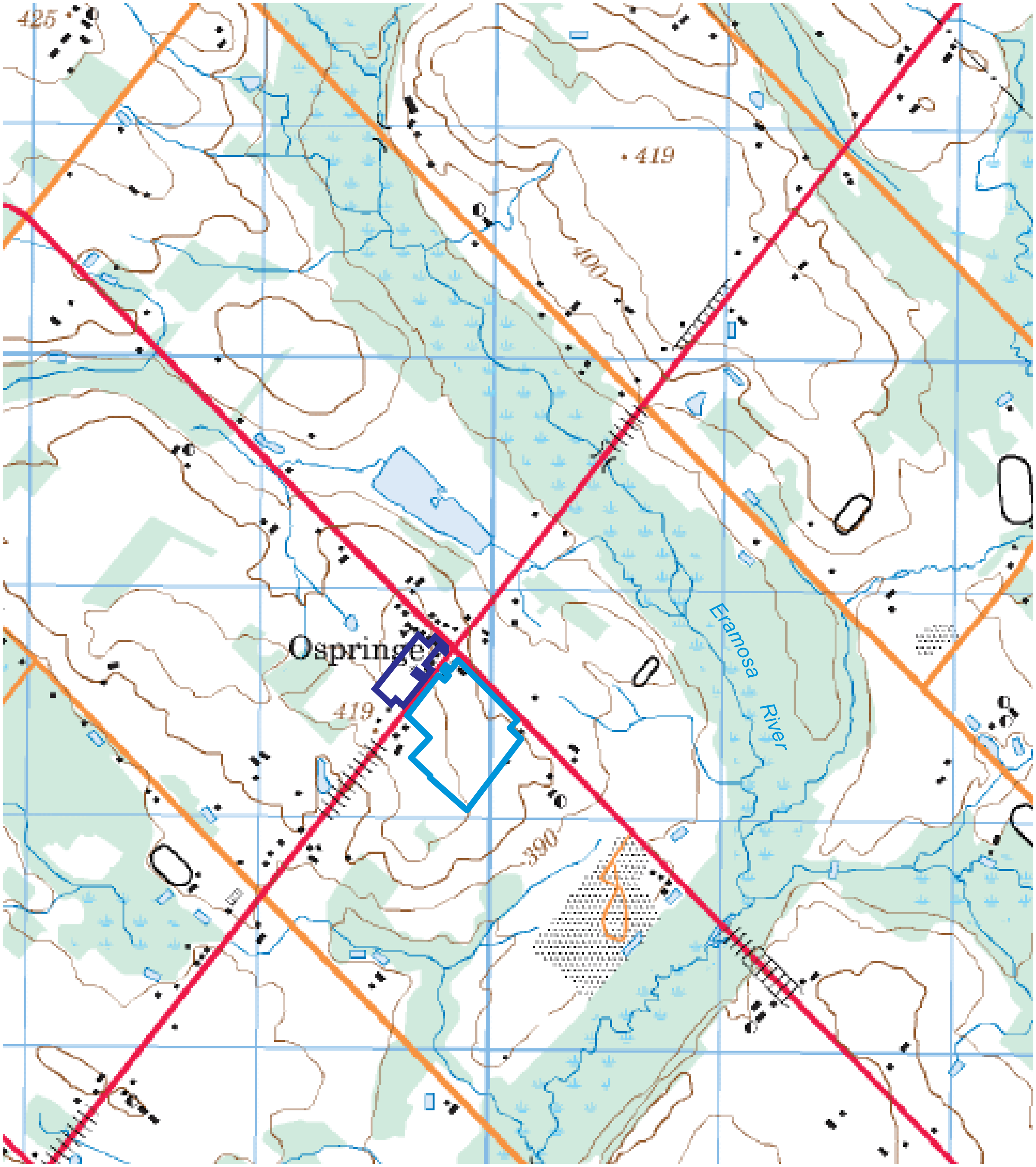
William (Sandy) Anderson, M.Sc., P.Eng. Lauren Curnow, B.Sc.
Senior Hydrogeologist and Engineer Environmental Scientist

6.0 REFERENCES

The following documents, maps, or other publications have been used in the preparation of this report.

- "Pleistocene Geology of the Guelph Area" (Map 2153), Karrow, P. F. (1968).
- "Quaternary Geology of the Cambridge Area", Karrow, P. F. (1987).
- "Paleozoic Geology of the Guelph Area" (Map 2342), Telford, P. G. (1973).
- "Hydrogeological Report and Site Servicing Study, Part of East Half of Lot 13, Concession 2, Township of Erin (Thomasfield Homes Ltd.)", GM BluePlan Engineering (July 2016).
- "Wastewater Servicing Assessment, Proposed Residential Subdivision, Part of Lot 13, Concession 2, Ospringe, Town of Erin", Flowspec Engineering (2019).
- "Geotechnical Investigation, Proposed Residential Development, Part of Lot 13, Concession 2, Town of Erin", CVD Engineering (November 2018).
- "Functional Servicing Report, Draft Plan of Subdivision, Ospringe Development", IBI Group (2019).
- "Stormwater Management Report, Ospringe Development, Wellington County", IBI Group (2019).
- Ministry of the Environment Hydrogeological Technical Information Requirements for Land Development Applications, MOE (April 1995).
- Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment (Procedure D-5-4), MOE, (August 1996).
- Technical Guideline for Private Wells: Water Supply Assessment (Procedure D-5-5), MOE (August 1995).
- Ontario Building Code – Part 8 Sewage Systems, SB-5 Approved Sewage Treatment Units, Appendix A Other Treatment Units, 2012 Building Code Compendium, (2012).
- Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance, C.W. Thornthwaite and J. R. Mather (1957).

APPENDIX A
Figures 1 to 8



LEGEND

Subject Development Property

Thomasfield Development Property

Map Source: NTS Guelph 40 P/9, 2000.

N

0 250 500 m

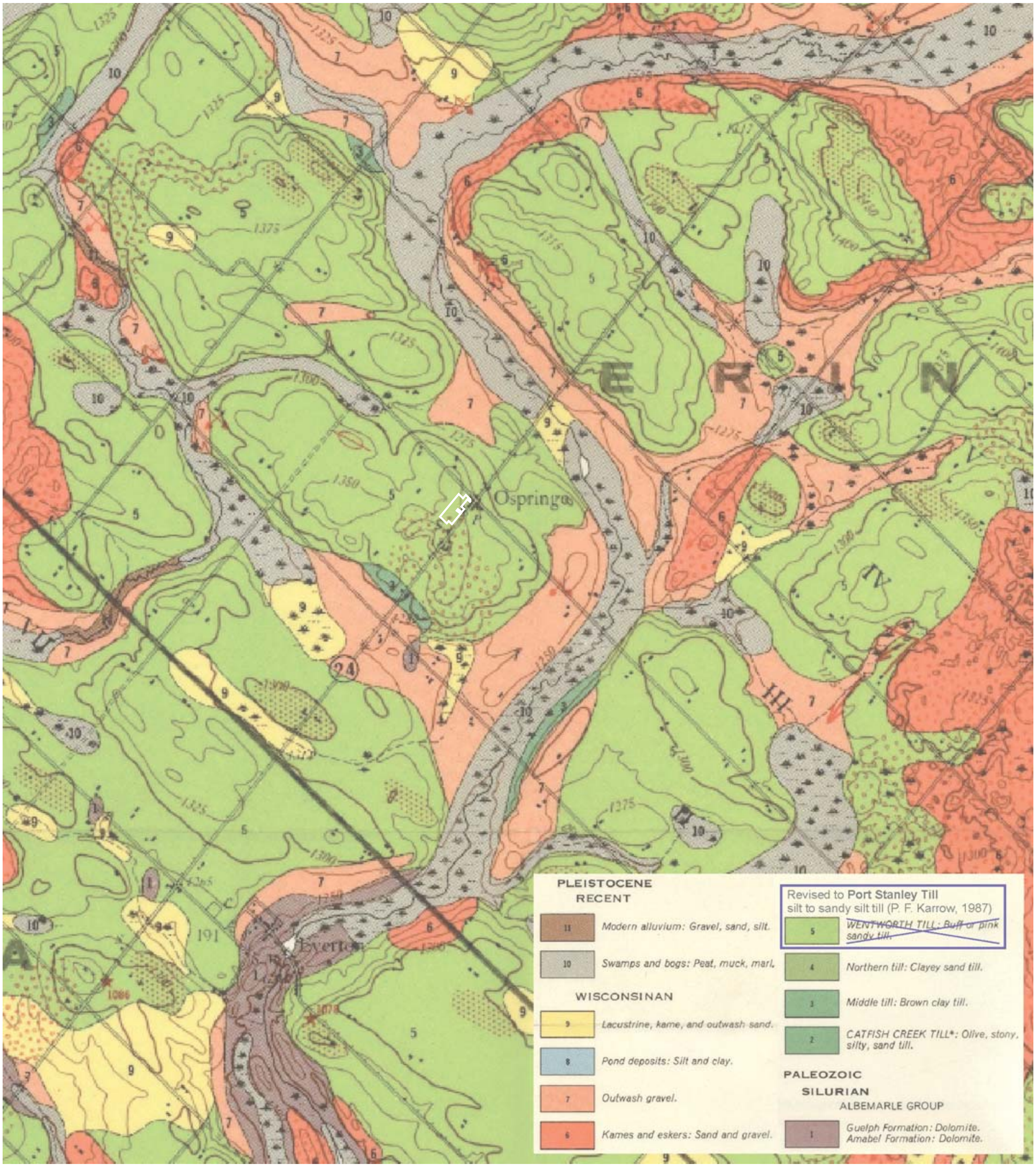
Scale 1:25,000

Figure 1 Site Location

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

Drawn By: LC	Date: Jan 31, 2019	File No. H16051

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 2E1 / 519-742-8979



LEGEND

Property

Map Source: Pleistocene Geology of the Guelph Area, P. F. Karrow, (Map 2153), 1968.

N

0 500 1000 m

Scale 1:50,000

Figure 2 Quaternary Geology

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

Drawn By: LC	Date: Jan 31, 2019	File No. H16051

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LEGEND

Property

Map Source: Paleozoic Geology of the Guelph Area, P. G. Telford, (Map 2342), 1973.

0 500 1000 m

Scale 1:50,000

Figure 3 Paleozoic Geology

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

Drawn By: LC	Date: Jan 31, 2019	File No. H16051

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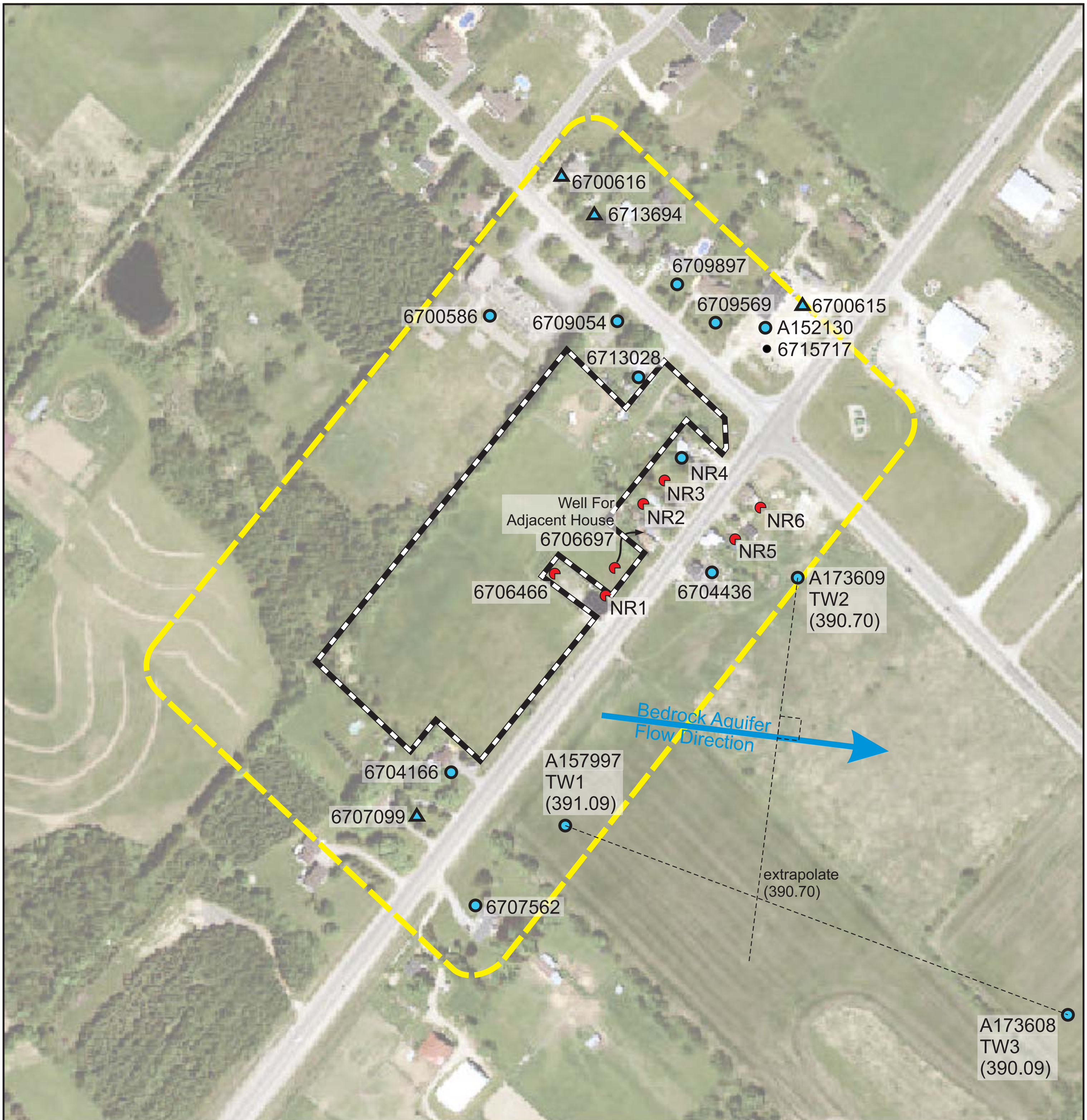

LEGEND

	Property Boundary
	Well Inventory Area (100 m)
	Drilled Private Well - Confirmed Location
	Drilled Private Well - Unconfirmed Location
	Dug Private Well
	Monitoring Well Cluster
A173609	MECP Well Record Number
NR6	No Record Well Reference (from inventory)
(390.70)	Bedrock Potentiometric Elevation (mASL) (GM BluePlan, 2016)

Map Source: 2015 Orthoimagery, GRCA Web-Map

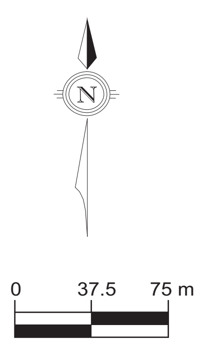

Figure 4 Well Inventory Map

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

Drawn By: LC	Date: Jan 31, 2019	File No.: H16051

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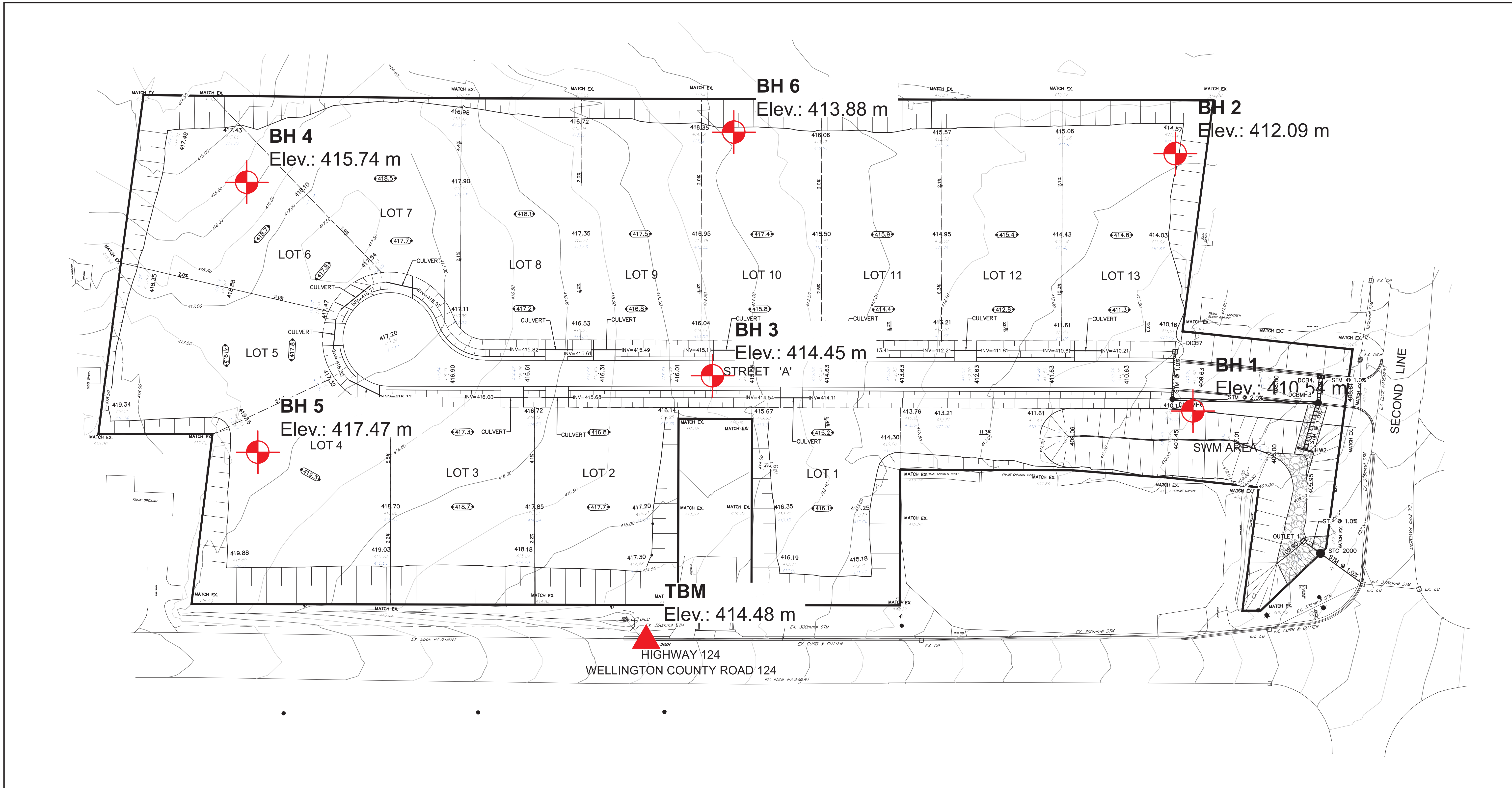

LEGEND

BH 5
Elev.: 417.47 m

Borehole
and Ground Elevation

0 25 75 m

Scale 1:1,000

Figure 5
Topography and Borehole Locaitons

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

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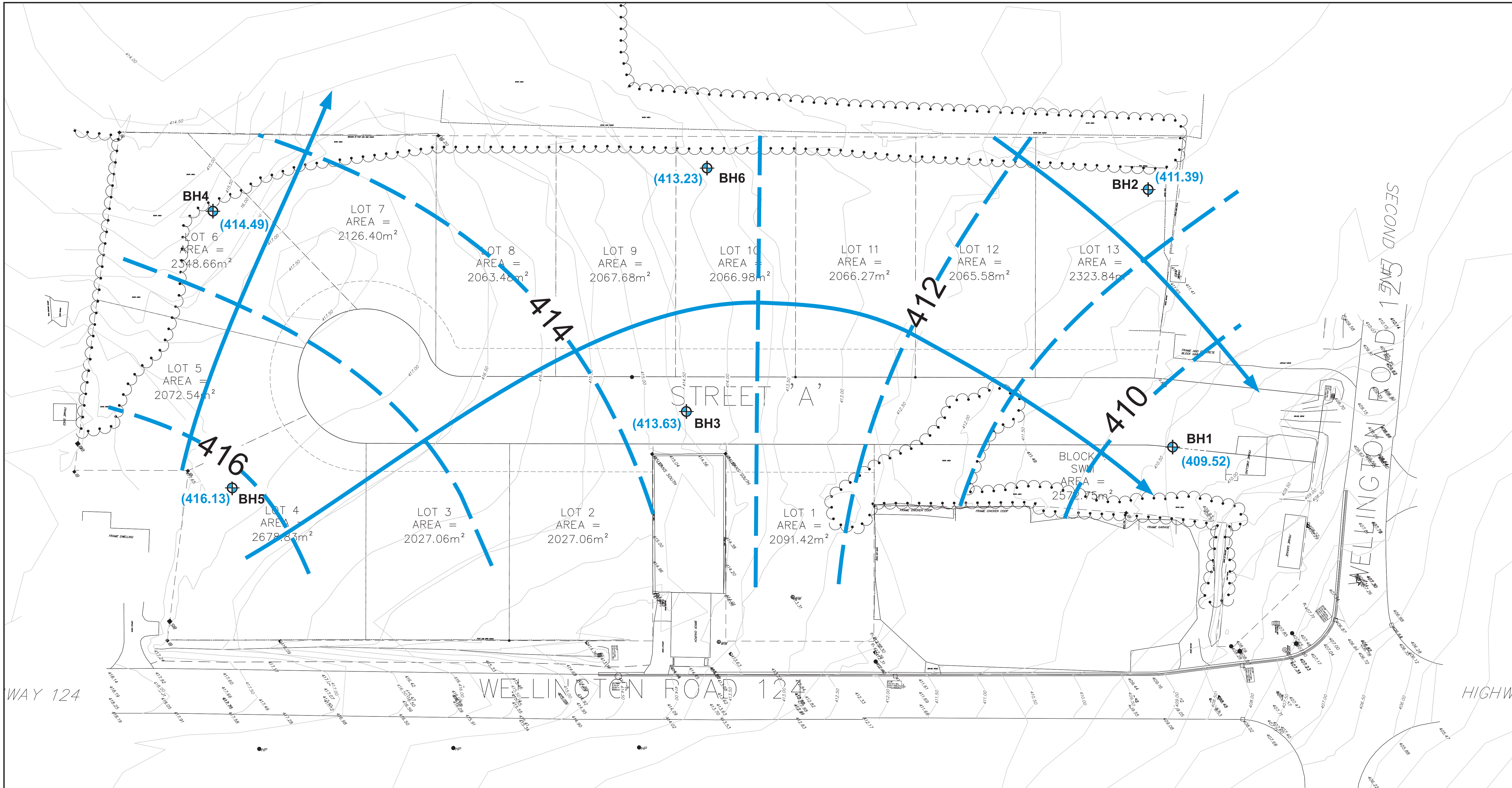
Drawn By: LC	Date: Jan 31, 2019	File No.: H16051



LEGEND

BH1	Borehole / Monitoring Well
(413.63)	Measured Water Table Elevation (mASL) (May 11, 2018)
412	Interpreted Water Table Contour (mASL) (May 11, 2018)
→	Interpreted Groundwater Flow Direction

N

0 25 75 m

Scale 1:1,000

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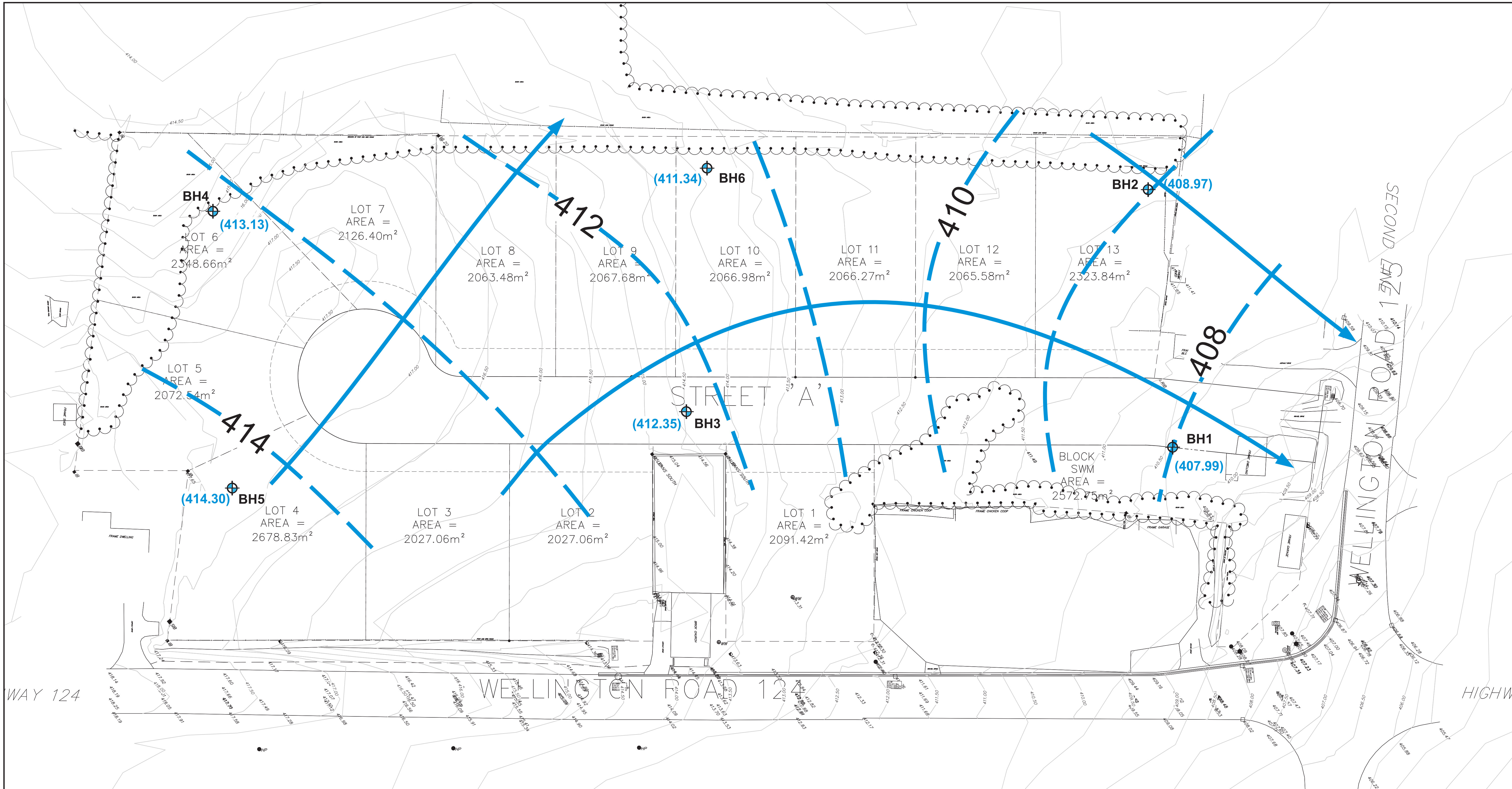
Figure 6
Interpreted Water Table - Spring 2018

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

Drawn By: LC	Date: Jan 31, 2019	File No.: H16051



LEGEND

BH1 Borehole / Monitoring Well

(413.63) Measured Water Table Elevation (mASL) (July 31, 2018)

412 Interpreted Water Table Contour (mASL) (July 31, 2018)

Interpreted Groundwater Flow Direction

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Figure 7
Interpreted Water Table - Summer 2018

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

Drawn By: LC	Date: Jan 31, 2019	File No.: H16051

LEGEND

- Future Supply Well for Development Lots (Location Approximate for Drawdown Analysis)
- Recommended Replacement Supply Well at Neighbouring Church / Residences with Dug Wells (Location Approximate for Drawdown Analysis)

0 25 75 m

Scale 1:1,000

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Figure 8
Future Supply Well Locations for Drawdown Analysis

Hydrogeological Investigation
Part of Lot 13, Concession 2
Ospringe, Town of Erin, ON

Drawn By: LC	Date: Jan 31, 2019	File No.: H16051

APPENDIX B
Table 1 to 4

Table 1 Summary of Monitoring Well Water Levels & Elevations

H16051 Ospringe Development
Jan 31, 2019

Well	Ground Elevation (m ASL)	TOP Elevation (m ASL)	Water Level (m Below Ground)		Water Level Elevation (mASL)		Fluctuation (m)
			11-May-18	31-Jul-18	11-May-18	31-Jul-18	11-May-18 31-Jul-18
BH1	410.54	411.28	1.02	2.55	409.52	407.99	-1.53
BH2	412.09	412.84	0.70	3.12	411.39	408.97	-2.42
BH3	414.45	415.14	0.82	2.10	413.63	412.35	-1.28
BH4	415.74	416.40	1.25	2.61	414.49	413.13	-1.36
BH5	417.47	418.20	1.35	3.18	416.13	414.30	-1.83
BH6	413.88	414.56	0.64	2.54	413.23	411.34	-1.90

Notes: 1) TOP - Top of Pipe

Table 2 Well Inventory Summary

H16051 Ospringe Development

Jan 31, 2019

Well ID	Well Type	Total Depth (ft)	Depth to Bedrock (ft)	Static Water Level (ft)	Pumping Test Duration	Pumping Rate (gpm)	Drawdown (ft)	Specific Capacity (gpm/ft)
6700586	Drilled	270	117	87	2	20	8	2.50
6700615	Drilled	170	75	36	2	7	44	0.16
6700616	Drilled	163	98	52	11	10	8	1.25
6704166	Drilled	141	138	80	3.5	10	1	10.00
6704436	Drilled	145	116	51	2.5	10	14	0.71
6707099	Drilled	191.5	162	91	2.5	90	99	0.91
6707562	Drilled	147	142	80	12	10	3	3.33
6709054	Drilled	186	99	78	1.5	12	9	1.33
6709569	Drilled	185	95	45	1.5	10	30	0.33
6709897	Drilled	220	93	53	1.5	9	27	0.33
6713028	Drilled	143	100	65	1	12	55	0.22
6713694	Drilled	142	97	65	1	20	16	1.25
A152130	Drilled	197	87	53	1	13	17	0.76
NR4	Drilled	-	-	-	-	-	-	-
A157997	Drilled Test Well 1	142	124	83	7.6	20	3.7	5.41
A173609	Drilled Test Well 2	200	94	53	7.6	20	41.7	0.48
A173608	Drilled Test Well 3	162	106	48	5.5	20	26.9	0.74
7224420	Abandonment	-	-	-	-	-	-	-
6715717	Monitoring well	17	-	7	-	-	-	-
6706466	Dug water supply	32	-	21	-	-	-	-
6706697	Dug water supply	29	-	6	1	2	23	0.09
NR3	Dug water supply	-	-	-	-	-	-	-
NR2	Dug water supply	-	-	-	-	-	-	-
NR5	Dug water supply	-	-	-	-	-	-	-
NR6	Dug water supply	-	-	-	-	-	-	-
NR1	Dug water supply	-	-	-	-	-	-	-

Note: Test Data and Water Levels for Test Wells 1, 2 and 3 from GM BluePlan report (2016), not from well records

Table 3 Drawdown Calculations at Lot 9 Well

H16051 Ospringe Development
Jan 31, 2019

Transmissivity =	(m^2/s)	1.0E-03	1.0E-03	1.0E-03	1.0E-03
	(m^2/day)	86.4	86.4	86.4	86.4
Storativity =	-	1.0E-04	1.0E-04	1.0E-04	1.0E-04
Discharge Rate =	(m^3/day)	18	1.5	1.5	1.5
Instantaneous Rate =	(L/min)	12.5	1.04	1.04	1.04
Pumping Duration =	(days)	0.083	1	365	1825
Lot Well	**Distance to Lot 9 Well (m)**	**2 hour Drawdown at Peek Demand Rate * (m)**	**1 day Drawdown at Average Daily Rate (m)**	**1 year Drawdown at Average Daily Rate (m)**	**5 year Drawdown at Average Daily Rate (m)**
1	70	0.058	0.008	0.016	0.019
2	50	0.069	0.009	0.017	0.020
3	69	0.058	0.008	0.016	0.019
4	97	0.047	0.007	0.015	0.018
5	103	0.045	0.007	0.015	0.018
6	93	0.048	0.007	0.016	0.018
7	67	0.059	0.008	0.017	0.019
8	32	0.084	0.010	0.019	0.021
9	**0.1**	**0.275**	**0.026**	**0.034**	**0.037**
10	32	0.084	0.010	0.019	0.021
11	64	0.061	0.009	0.017	0.019
12	96	0.047	0.007	0.016	0.018
13	128	0.038	0.007	0.015	0.017
new neighbour 1	53	0.067	0.009	0.017	0.019
new neighbour 2	99	0.046	0.007	0.015	0.018
new neighbour 3	117	0.041	0.007	0.015	0.017
new neighbour 4	137	0.036	0.006	0.015	0.017
Total Drawdown at Lot 9 from All Wells		**1.16**	**0.16**	**0.29**	**0.33**

NOTES:

1) Calculated drawdown by Jacob Non-Equilibrium Equation does not include recharge from:
a) precipitation, b) septic system infiltration
2) Transmissivity & Storativity are based on Pumping Test Values From Tests at Wells TW1 and TW2 (Thomasfield Development)
3) For Peek Demand - assume entire daily flow of 1.5 m^3 occurs in 2 hours
4) All well locations are assumed to be at the midpoint of each lot frontage (See Figure 7)

Table 4 Nitrate Loading Calculation

H16051 Ospringe Development
Jan 31, 2019

Basic Assumptions:

1000 L/day effluent flow per household
Post-development recharge rate to sand/silt soils with an open ditch rural cross-section roadway and SWM pond
= pre-development water balance rate of 0.24 m/yr
nitrate mass in effluent assumes tertiary treatment system capable of 30% nitrogen reduction (e.g., 40 g/day x 0.7)
no groundwater crossflow, no enhanced recharge, no in-situ denitrification

Calculation Scenario:	Tertiary 30% N Reduction
Number Houses	13
Effluent Volume per House (L/day)	1,000
Nitrate Mass in Effluent per House (g/day)	28
Recharge Area (m^2)	36,200
Recharge Rate (m/yr)	0.24
Total Mass Nitrate (g/yr)	132,860
Volume Effluent (m^3/yr)	4,745
Volume Recharge (m^3/yr)	8,688
Total Volume Water (m^3/yr)	13,433
Resultant Nitrate Loading (g/m^3 or mg/L)	9.9

APPENDIX C
Borehole Logs & Grain Size Analyses

FILE No: H16051 BOREHOLE No. 1

Client: **Spirit of Pentecost**

Project: **Proposed Residential Development**

Location: **Part of Lot 13, Concession 2, Town of Erin (Ospringe)**

EQUIPMENT DATA

Machine: **Diedrich D-50T**
Method: **Hollow Stem Auger**
Size: **107 mm ID**
Date: **May 03 - 18** TO **May 03 - 18**

SOIL LITHOLOGY

Ground Elevation: **410.54 m**

ELEV./DEPTH (m)	DESCRIPTION
	400 mm TOPSOIL
410.14 / 0.40	loose, brown SANDY SILT trace to some gravel, trace clay moist
409.17 / 1.37	compact, brown SAND AND GRAVEL some silt saturated
408.41 / 2.13	dense, brown SILTY SAND trace gravel saturated
405.66 / 4.88	very dense grey SILT trace sand, trace gravel saturated
404.19 / 6.35	End of Borehole

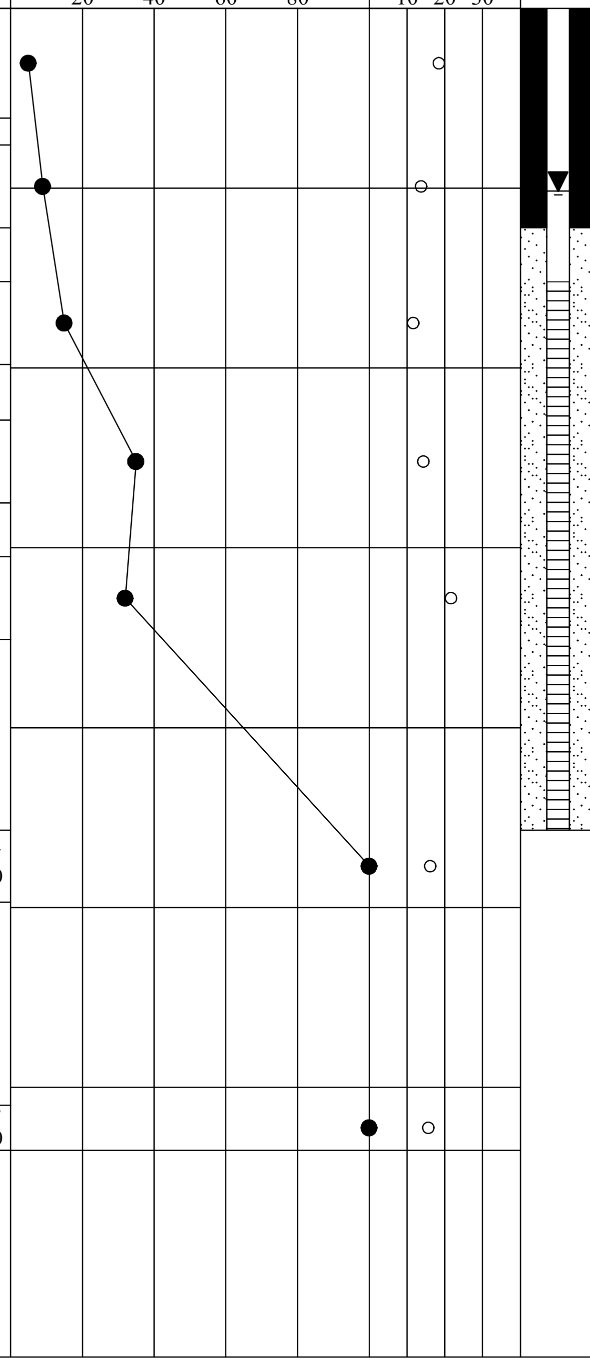
SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	5
2	SS	9
3	SS	15
4	SS	35
5	SS	32
6	SS	50/100
7	SS	50/100

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA



REMARKS

DEPTH (m)	REMARKS
	Monument well casing
0.5	Bentonite seal
1.0	Ground water measured at 1.02 m on May 11, 2018
2.0	Filter sand
3.0	3.05 m screen
4.5	Monitoring well installed in BH1 at 4.57 m

PROJECT MANAGER: **LC**

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ENGINEERING LTD.
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Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: H16051 — BOREHOLE No. 2

Client:	**Spirit of Pentecost**
Project:	**Proposed Residential Development**
Location:	**Part of Lot 13, Concession 2, Town of Erin (Ospringe)**

EQUIPMENT DATA

Machine:	**Diedrich D-50T**
Method:	**Hollow Stem Auger**
Size:	**107 mm ID**
Date:	**May 03 - 18** TO **May 03 - 18**

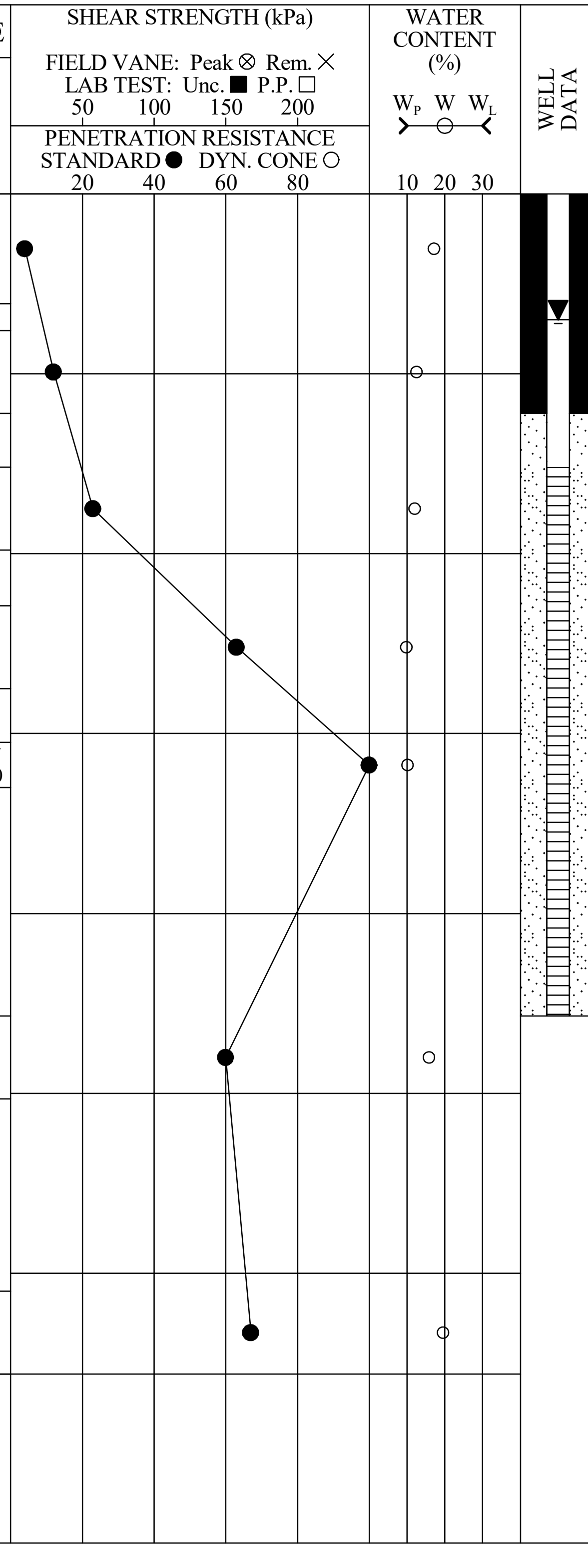
SOIL LITHOLOGY

Ground Elevation: **412.09 m**

ELEV./ DEPTH (m)	DESCRIPTION
	450 mm TOPSOIL
411.64 0.45	compact, brown SAND AND SILT trace gravel, trace clay moist to saturated
410.72 1.37	compact to very dense brown SANDY SILT TILL trace gravel, trace clay moist to saturated ------------ sand and silt
406.60 5.49	very dense, grey SILT trace to some sand saturated
405.53 6.56	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	4
2	SS	12
3	SS	23
4	SS	63
5	SS	50/ 100
6	SS	60
7	SS	67



REMARKS

DEPTH (m)	REMARKS
	Monument well casing
0.5	Bentonite seal
	Ground water measured at 0.7 m on May 11, 2018
2.0	Filter sand
3.0	3.05 m screen
4.5	Monitoring well installed in BH2 at 4.57 m

PROJECT MANAGER: **LC**

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Enclosure No.: 3
Sheet 1 of 1

FILE No: H16051 — BOREHOLE No. 3

Client:	**Spirit of Pentecost**
Project:	**Proposed Residential Development**
Location:	**Part of Lot 13, Concession 2, Town of Erin (Ospringe)**

EQUIPMENT DATA

Machine:	**Diedrich D-50T**
Method:	**Hollow Stem Auger**
Size:	**107 mm ID**
Date:	**May 03 - 18** TO **May 03 - 18**

SOIL LITHOLOGY

Ground Elevation: **414.45 m**

ELEV./ DEPTH (m)	DESCRIPTION
	400 mm TOPSOIL
414.05 / 0.40	compact to dense brown mottled SAND AND SILT trace gravel, trace clay moist to saturatedf
411.55 / 2.90	dense, brown fine SAND trace silt saturated
410.34 / 4.11	compact, brown SAND AND SILT saturated
408.81 / 5.64	very dense, brown SILT trace sand saturated
407.91 / 6.54	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	3
2	SS	10
3	SS	18
4	SS	32
5	SS	36
6	SS	25
7	SS	50/ 140

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

REMARKS

DEPTH (m)	REMARKS
	Monument well casing
0.5	Bentonite seal
	Ground water measured at 0.82 m on May 11, 2018
2.0	Filter sand
3.0	3.05 m screen
	Monitoring well installed in BH3 at 4.57 m

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ph. (519) 742-8979, fx. (519) 742-7739

FILE No: H16051

BOREHOLE No. 4

Client: **Spirit of Pentecost**

Project: **Proposed Residential Development**

Location: **Part of Lot 13, Concession 2, Town of Erin (Ospringe)**

EQUIPMENT DATA

Machine: **Diedrich D-50T**
Method: **Hollow Stem Auger**
Size: **107 mm ID**
Date: **May 03 - 18** TO **May 03 - 18**

SOIL LITHOLOGY

Ground Elevation: **415.74 m**

ELEV./DEPTH (m)	DESCRIPTION
415.41 / 0.33	330 mm TOPSOIL
412.84 / 2.90	loose to compact brown SANDY SILT moist to saturated
409.18 / 6.56	dense brown to grey SILT trace sand saturated
	End of Borehole

SAMPLE

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)

SAMPLE ID	TYPE	N-VALUE
1	SS	3
2	SS	6
3	SS	12
4	SS	25
5	SS	31
6	SS	35
7	SS	38

REMARKS

DEPTH (m)	REMARKS
	Monument well casing
0.5	Bentonite seal
	Ground water measured at 1.25 m on May 11, 2018
2.0	Filter sand
3.0	3.05 m screen
	Monitoring well installed in BH4 at 4.57 m

PROJECT MANAGER: **LC**

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ph. (519) 742-8979, fx. (519) 742-7739

FILE No: H16051 BOREHOLE No. 5

Client:	**Spirit of Pentecost**
Project:	**Proposed Residential Development**
Location:	**Part of Lot 13, Concession 2, Town of Erin (Ospringe)**

EQUIPMENT DATA

Machine:	**Diedrich D-50T**
Method:	**Hollow Stem Auger**
Size:	**107 mm ID**
Date:	**May 03 - 18** TO **May 03 - 18**

SOIL LITHOLOGY — Ground Elevation: **417.47 m**

ELEV./ DEPTH (m)	DESCRIPTION
	330 mm TOPSOIL
417.14 / 0.33	compact to very dense brown SANDY SILT TILL trace gravel, trace clay; moist to saturated; ----------- grey; ----------- occ. sand seams
410.46 / 7.01	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	5
2	SS	14
3	SS	14
4	SS	63
5	SS	86
6	SS	68
7	SS	60

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)

WELL DATA

REMARKS

DEPTH (m)	REMARKS
	Monument well casing
1.35	Ground water measured at 1.35 m on May 11, 2018
2.0	Bentonite seal
4.0	Filter sand
5.5	3.05 m screen
7.0	Monitoring well installed in BH5 at 7.01 m

PROJECT MANAGER: **LC**

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ENGINEERING LTD.
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ph. (519) 742-8979, fx. (519) 742-7739

FILE No: H16051

BOREHOLE No. 6

Client: **Spirit of Pentecost**

Project: **Proposed Residential Development**

Location: **Part of Lot 13, Concession 2, Town of Erin (Ospringe)**

EQUIPMENT DATA

Machine: **Diedrich D-50T**
Method: **Hollow Stem Auger**
Size: **107 mm ID**
Date: **May 03 - 18** TO **May 03 - 18**

Ground Elevation: **413.88 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	Water content (%)	DEPTH (m)	REMARKS
413.58 / 0.30	300 mm TOPSOIL						Monument well casing
	brown SAND AND SILT trace gravel moist to saturated					0.5	Bentonite seal
							Ground water measured at 0.64 m on May 11, 2018
						2.0	Filter sand
410.83 / 3.05						3.0	3.05 m screen
	dense to very dense brown to grey SILT trace sand saturated	1	SS	39			
		2	SS	51		4.5	Monitoring well installed in BH6 at 4.57 m
408.85 / 5.03	End of Borehole						

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

PROJECT MANAGER: **LC**

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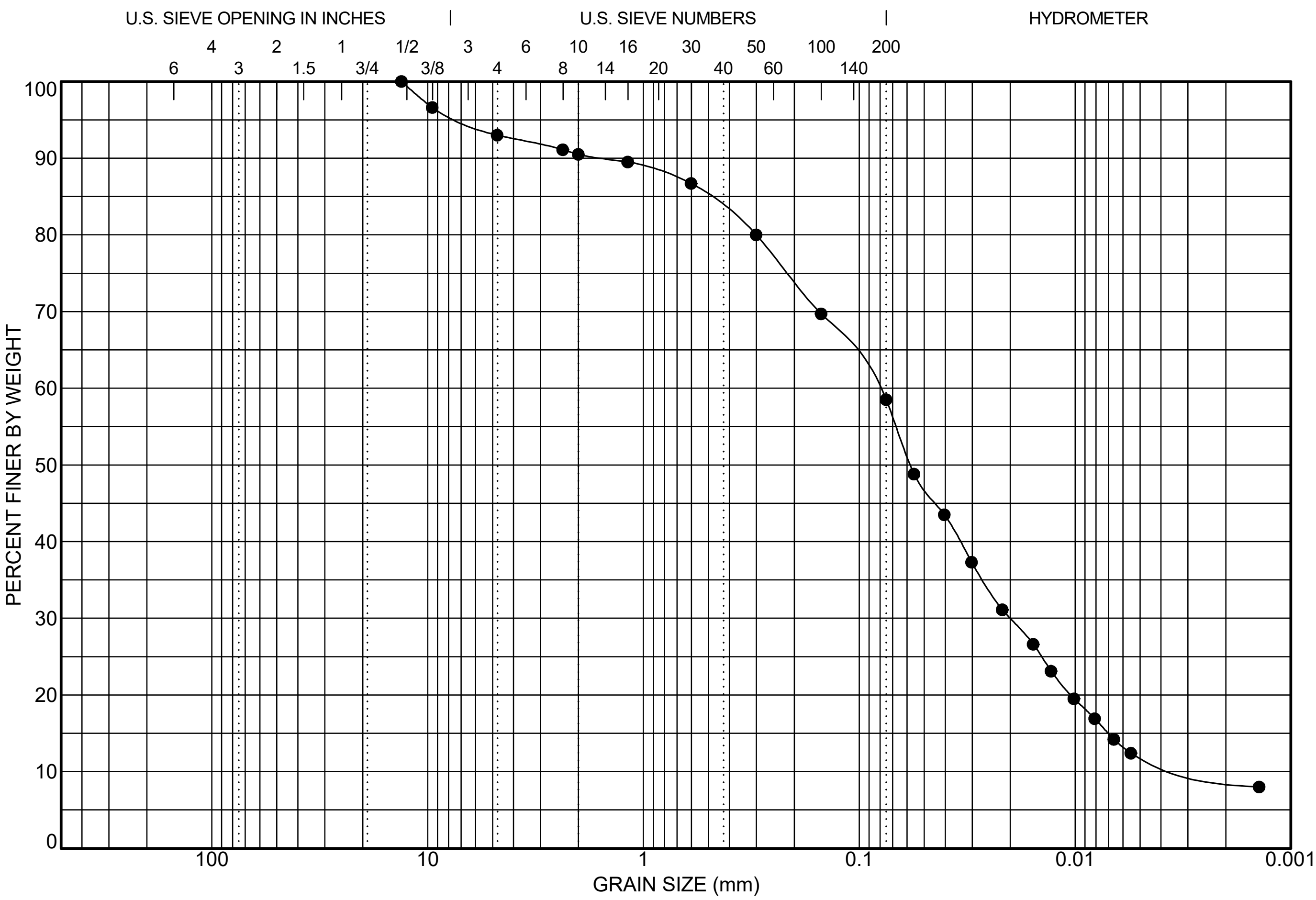


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.87	31.56	13.2	0.082	0.02	0.003	7.0	34.5	58.5	

Date:	Jul. 03 - 2018
Client:	Spirit of Pentecost
Contractor:	
Source:	
Sampled From:	BH 2 - SA 2, 0.76 to 1.22 m depth
Sample No.:	2-2
Date Sampled:	May. 03 - 2018
Sampled By:	LC
Lab No.:	3145
Date Tested:	May. 31 - 2018
Type of Material:	Sand and Silt, trace gravel, trace clay

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

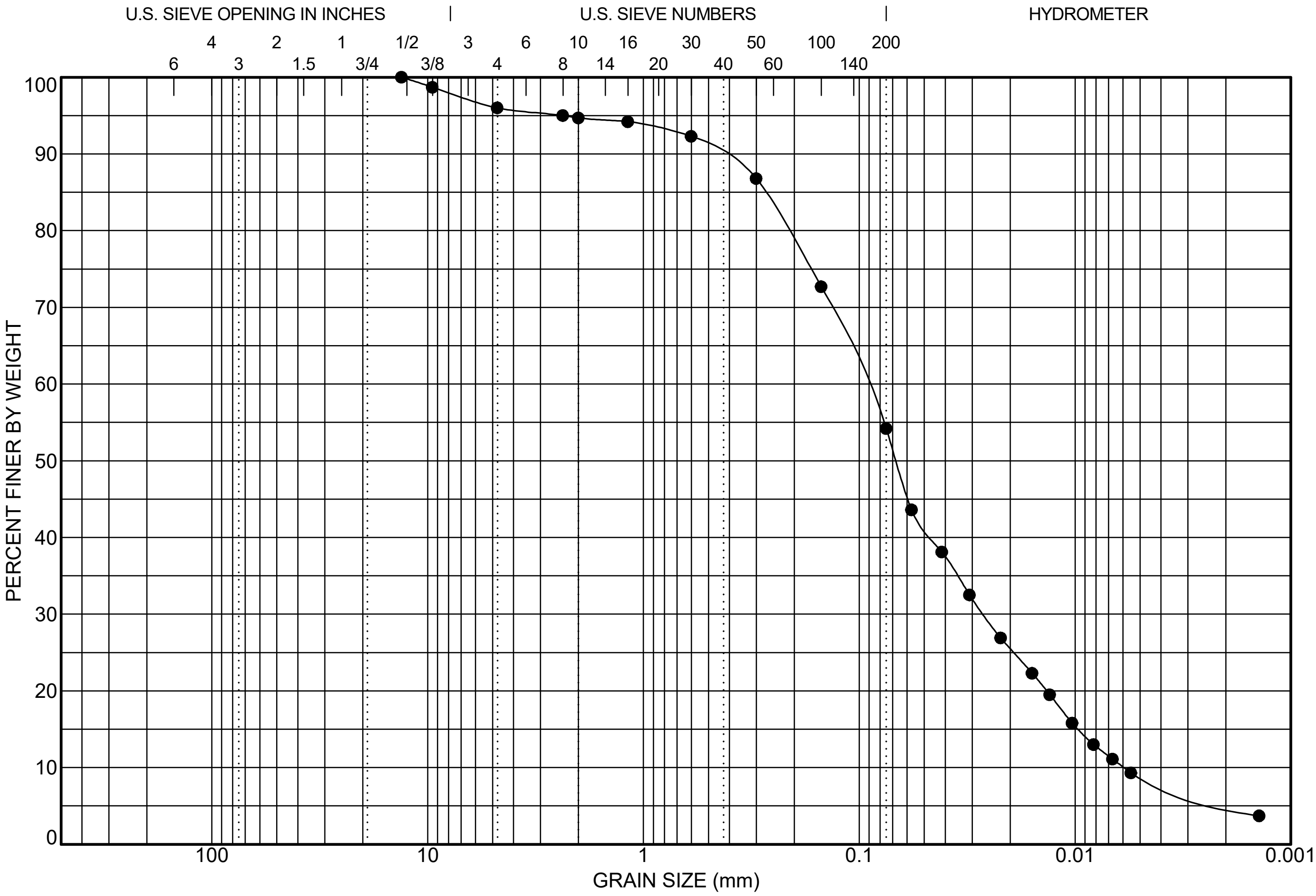
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: Part of Lot 13, Concession 2, Town of Erin (Ospringe)

File No.: H16051

Enclosure No.: 7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.27	15.69	13.2	0.093	0.027	0.006	4.0	41.8	54.2	

Date: Jul. 03 - 2018
Client: Spirit of Pentecost
Contractor:
Source:
Sampled From: BH 3 - SA 2, 0.76 to 1.22 m depth
Sample No.: 3-2
Date Sampled: May. 03 - 2018
Sampled By: LC
Lab No.: 3146
Date Tested: May. 31 - 2018
Type of Material: Sand and Silt, trace gravel, trace clay

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

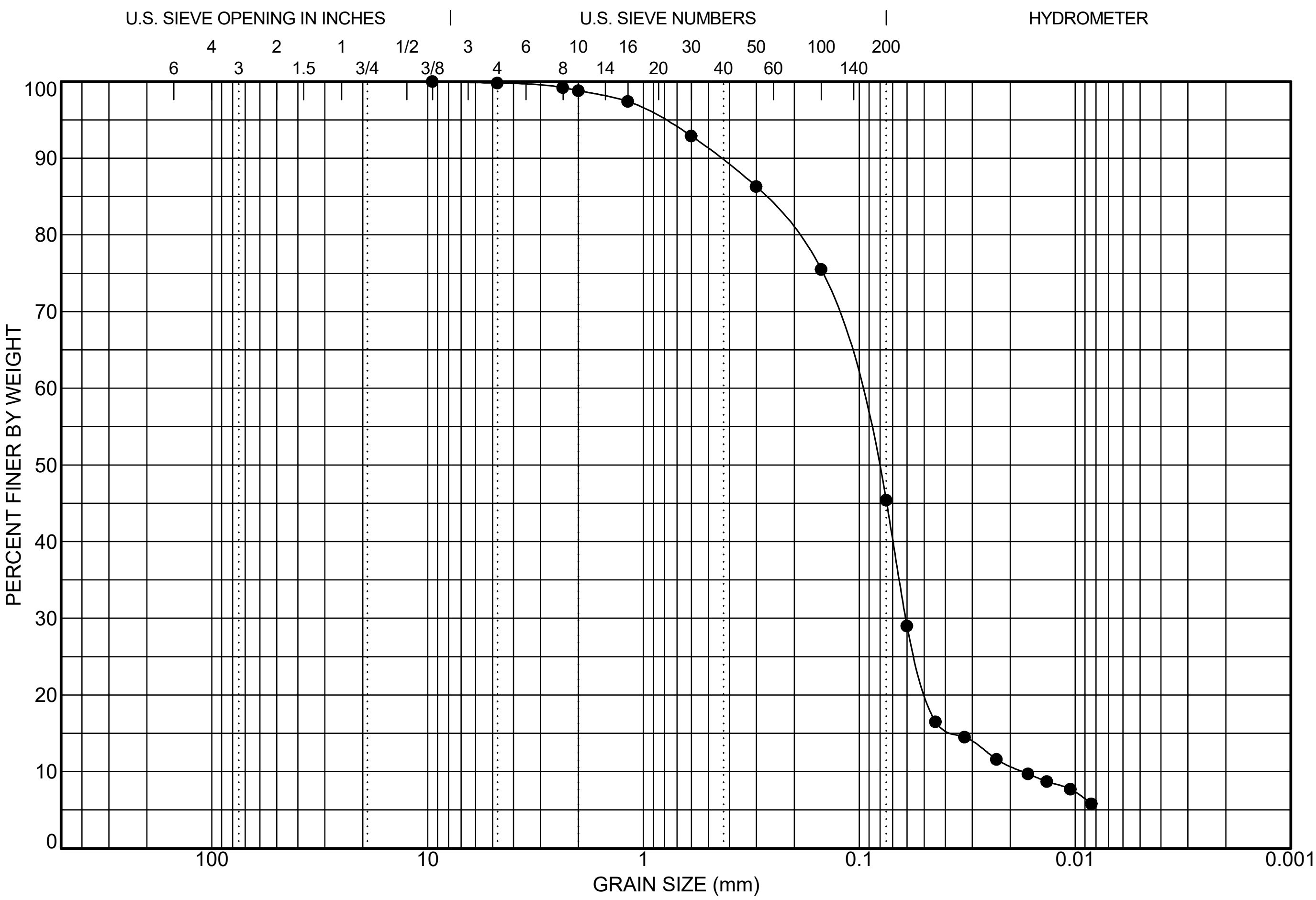
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: Part of Lot 13, Concession 2, Town of Erin (Ospringe)

File No.: H16051

Enclosure No.: 8



<table>
<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
</table>

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			2.03	6.03	9.5	0.105	0.061	0.017	0.2	54.4	45.4	

Date:	Jul. 03 - 2018
Client:	Spirit of Pentecost
Contractor:	
Source:	
Sampled From:	BH 3 - SA 4, 2.29 to 2.74 m depth
Sample No.:	3-4
Date Sampled:	May. 03 - 2018
Sampled By:	LC
Lab No.:	3147
Date Tested:	May. 31 - 2018
Type of Material:	Sand and Silt, trace gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

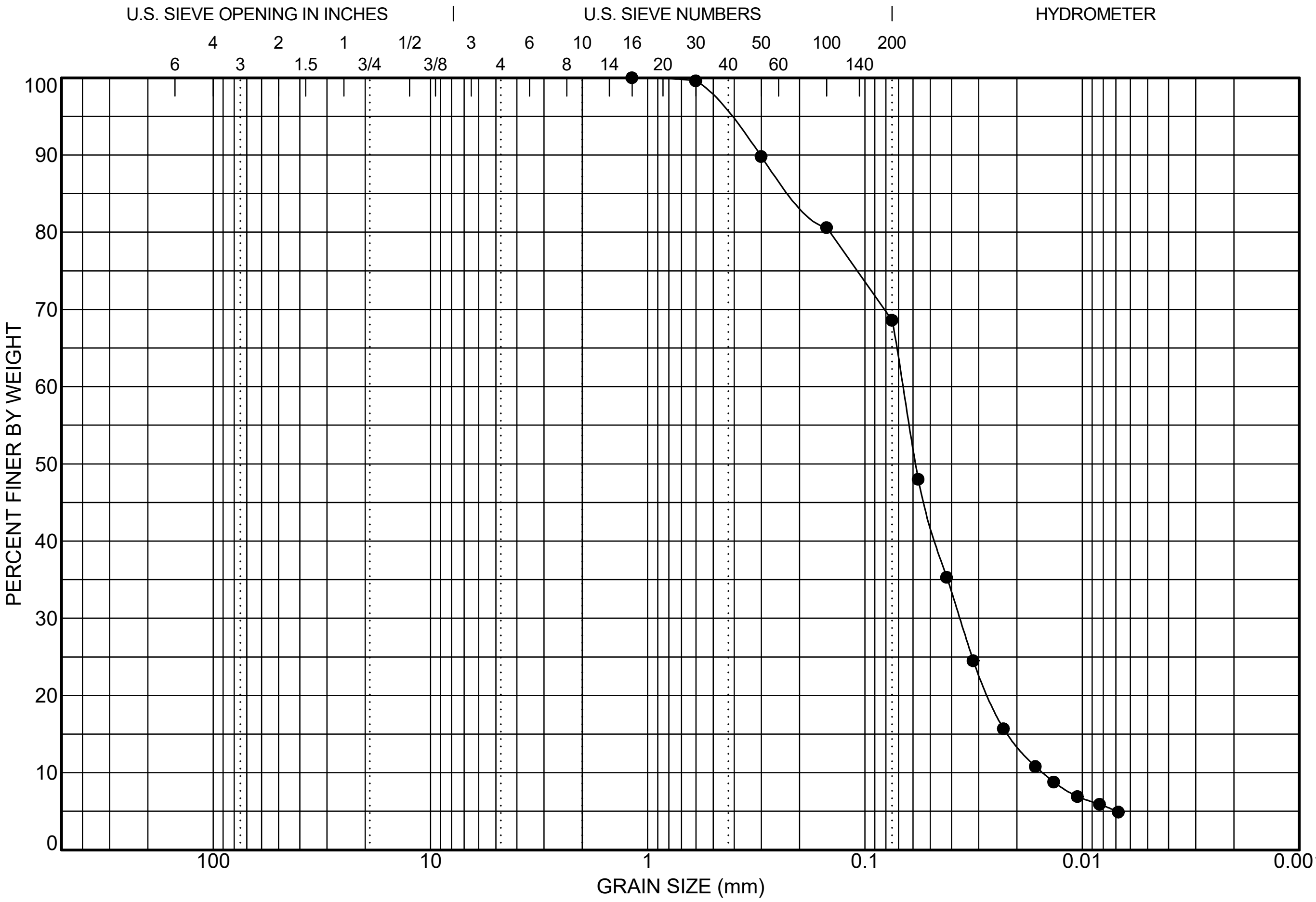
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: Part of Lot 13, Concession 2, Town of Erin (Ospringe)

File No.: H16051

Enclosure No.: 9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.32	4.40	1.18	0.067	0.037	0.015	0.0	31.4	68.6	

Date: Jul. 03 - 2018
Client: Spirit of Pentecost
Contractor:
Source:
Sampled From: BH 4 - SA 2, 0.76 to 1.22 m depth
Sample No.: 4-2
Date Sampled: May. 03 - 2018
Sampled By: LC
Lab No.: 3148
Date Tested: May. 31 - 2018
Type of Material: Sandy Silt

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

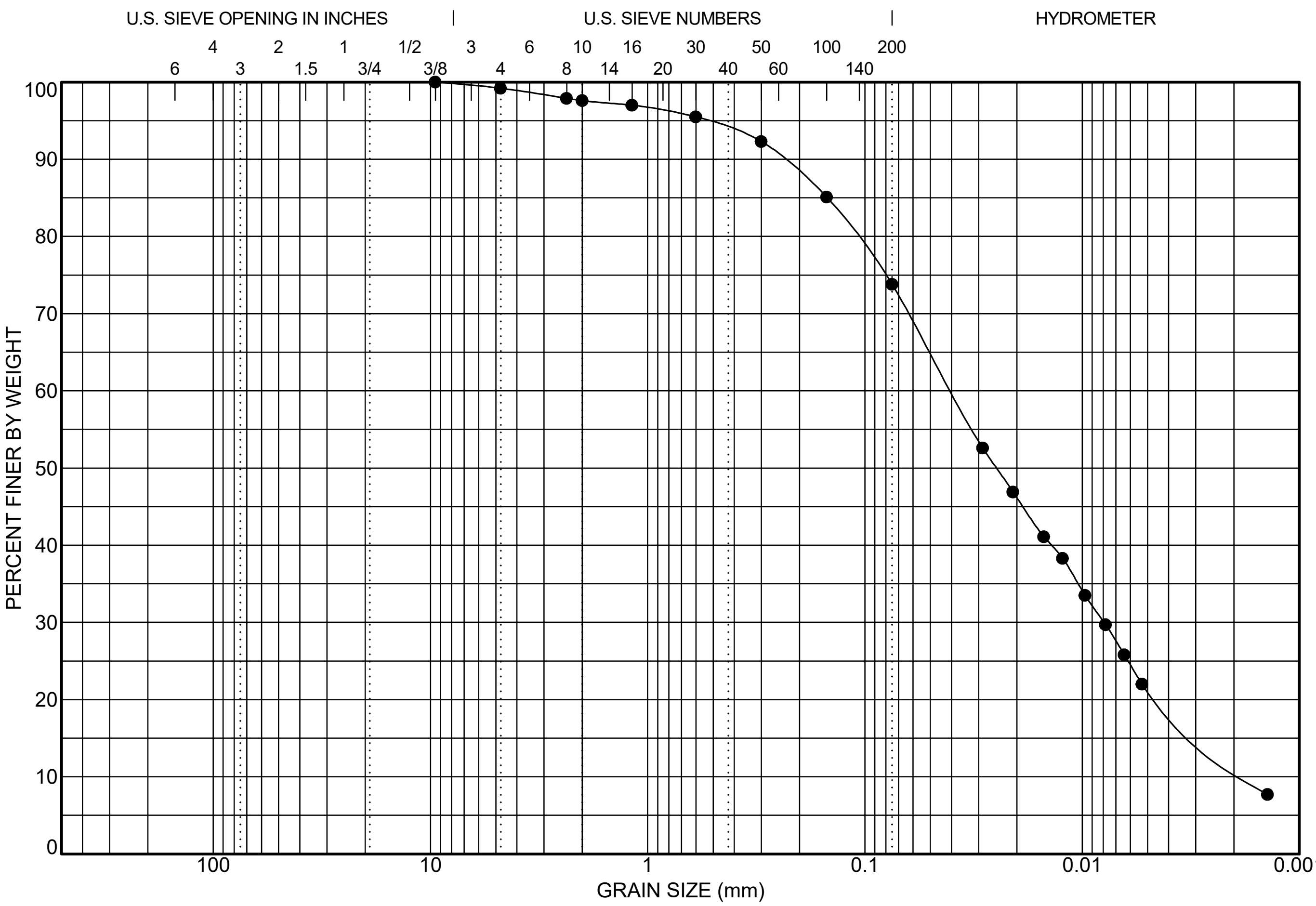
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: Part of Lot 13, Concession 2, Town of Erin (Ospringe)

File No.: H16051

Enclosure No.: 10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.90	23.14	9.5	0.04	0.008	0.002	0.8	25.4	73.8	

Date: Jul. 03 - 2018
Client: Spirit of Pentecost
Contractor:
Source:
Sampled From: BH 5 - SA 2, 0.76 to 1.22 m depth
Sample No.: 5-2
Date Sampled: May. 03 - 2018
Sampled By: LC
Lab No.: 3149
Date Tested: May. 31 - 2018
Type of Material: Sandy Silt Till, trace gravel, trace clay

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: Part of Lot 13, Concession 2, Town of Erin (Ospringe)

File No.: H16051

Enclosure No.: 11

DM - NO SPECIFICATIONS H16051 - PT. LOT 13, CONCESSION 2, OSPRINGE.GPJ LAW LNDN.GDT 18-11-12

APPENDIX D
Water Well Records

UTM [ ] Z [ ] E

Con 11 Lot 14

[5] R [ ] N

Elev. [5] R [1 3 1 5 5]

Basin [2 3]

13

The Ontario Water Resources Commission Act

WATER WELL RECORD

WATER RESOURCES DIVISION

67 No. 586

JUL 28 1964

ONTARIO WATER RESOURCES COMMISSION

County or District WELLINGTON Township, Village, ~~Town or City~~ ERIN

Con. 11 Lot 14 Date completed 26 (day) JUNE (month) 1964 (year)

Owner ERIN TSWP SCHOOL BOARD (print in block letters) Address OSPRINGE, ONT.

Casing and Screen Record		Pumping Test	
Inside diameter of casing	5"	Static level	87 FT
Total length of casing	120 FT	Test-pumping rate	20 G.P.M.
Type of screen		Pumping level	95 FT
Length of screen		Duration of test pumping	2 hrs
Depth to top of screen		Water clear or cloudy at end of test	CLEAR
Diameter of finished hole	5"	Recommended pumping rate	20 G.P.M.
		with pump setting of	130 feet below ground surface

Well Log: Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
BROWN CLAY - Rocks	0	20		
SAND	20	32	155 FT	FRESH
GREY CLAY - Rocks	32	117	160	
~~[illegible]~~				
BROWN - LIMESTONE	117	160		
DARK GREY - LIMESTONE	160	200	265 Ft	
LIGHT GREY - LIMESTONE	200	250	270	
WHITE LIMESTONE	250	270		

For what purpose(s) is the water to be used? Public - School

Is well on upland, in valley, or on hillside? UPLAND

Drilling or Boring Firm LADCO DRILLING

Address Hillsburg - R. R. #1

Licence Number 801

Name of Driller or Borer THOMAS LANG

Address Hillsburg R. R. #1

Date July 15/64

T. Lang

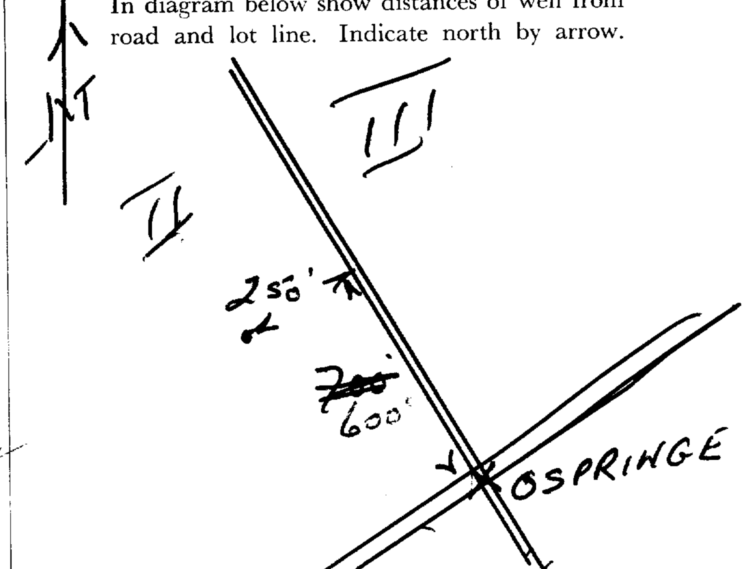
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

4"

UTM | | Z | | E

15 R | | N

Elev. 15 R 11325

Basin 23

67 № 615

F

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Wellington Township, Village, Town or City Erin

Con. 3 Lot 14 Date completed 9 (day) July (month) 1966 (year)

[redacted]ress Ospringe

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 90'

Type of screen NONE

Length of screen

Depth to top of screen

Diameter of finished hole 4"

Pumping Test

Static level 36 ft.

Test-pumping rate 7 G.P.M.

Pumping level 80 ft.

Duration of test pumping 2 hrs.

Water clear or cloudy at end of test Clear

Recommended pumping rate 4 G.P.M.

with pump setting of 80 feet below ground surface

Well Log / Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Clay and Boulders	0	75		
Light grey limestone	75	100	120 ft. 168 ft.	Fresh
Brown limestone	100	170		

For what purpose(s) is the water to be used? Domestic

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Ladco Drilling & Exploration Co.

Address R. R. #1 Hillsburgh, Ont.

Licence Number 1955

Name of Driller or Borer Ray Lang.

Address R.R.#1 Hillsburgh

Date July 9/66

Ray Lang

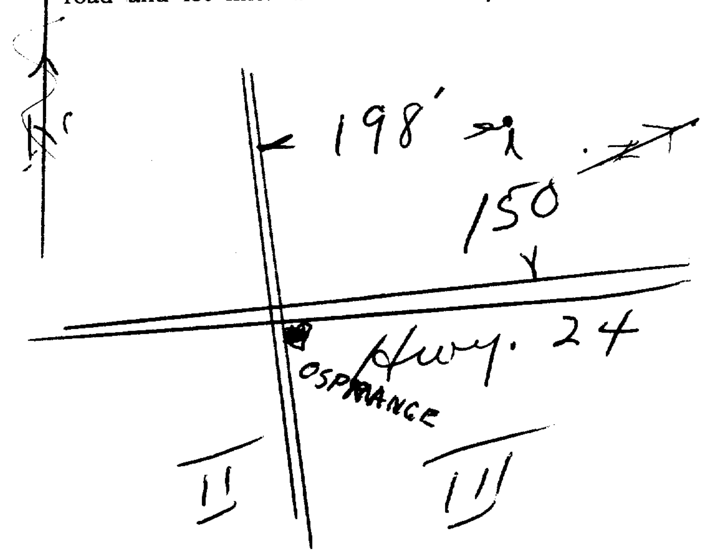
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS SS

UTM [ ] Z [ ] E

15 R [ ] N

Elev. 6 R 1 1 3 5 0

Basin 23

The Ontario Water Resources Commission Act

WATER WELL RECORD

67 No 616 7

WATER RESOURCES DIVISION
MAR 1 1967
ONTARIO WATER RESOURCES COMMISSION

County or District Wellington .... Township, Village, Town or City Erin

Con 3 part of Lot 14 .... Date completed 9th (day) February (month) 1967 (year)

[redacted]ress R R # 3 Acton,Ont.

Casing and Screen Record	
Inside diameter of casing	4 inch
Total length of casing	115 ft
Type of screen	nil
Length of screen	nil
Depth to top of screen	nil
Diameter of finished hole	4 inch

Pumping Test	
Static level	52 ft
Test-pumping rate	10 G.P.M.
Pumping level	60 ft
Duration of test pumping	11 hours
Water clear or cloudy at end of test	clear
Recommended pumping rate	10 G.P.M.
with pump setting of	95 feet below ground surface

Well Log: Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
brown clay & stones	0	28	155	fresh
brown clay & gravel	28	35		
brown bolders & clay	35	85		
brown clay and gravel	85	98		
light brown rock	98	140		
dark brown rock	140	163		
Total depth - 163 ft.				
well pit 7 ft.				

For what purpose(s) is the water to be used? domestic

Is well on upland, in valley, or on hillside? ~~upland~~ upland

Drilling or Boring Firm Graham Well Drilling
19 Kingsley Ct.

Address Guelph Ont.

Licence Number 2453

Name of Driller or Borer James Hawkins

Address Sheridan Street
Guelph Ont.

Date February 25th 1967

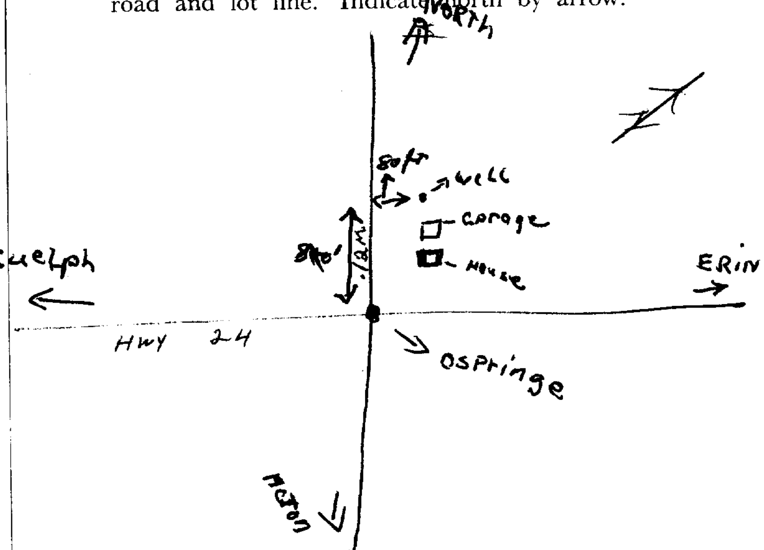
J L Graham - per NEG
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

O W R C COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



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40 P/9 E

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6704166 | MUNICIP. 67003 | CON. CON 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
WELLINGTON	ERIN	2	~~13~~ 014

[redacted] RR #1 GUELPH

DATE COMPLETED: DAY 14 MO. ~~Oct~~ 10 YR. 71

[redacted] 338260 | RC. 4 | ELEVATION 1374 | RC. 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
	CLAY + STONES - SAND LAYERS			0	138
	LIMESTONE			138	141

31 | 0138 05 1209 0141 15

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0141	☒ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
	☐ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
	☐ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
	☐ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
	☐ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
~~4~~ 04	☒ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE	.205	0	~~140~~ 0140
~~4~~ 04	☐ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☒ 4 OPEN HOLE		140	~~141~~ 0141
	☐ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☒ 1 PUMP ☐ 2 BAILER | PUMPING RATE 0010 GPM. | DURATION OF PUMPING 03 HOURS 30 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
080 FEET	081 FEET	081 FEET	081 FEET	081 FEET	081 FEET

WATER LEVELS DURING: ☒ 1 PUMPING ☐ 2 RECOVERY

IF FLOWING, GIVE RATE GPM. | PUMP INTAKE SET AT 110 FEET | WATER AT END OF TEST: ☒ 1 CLEAR ☐ 2 CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 110 FEET | RECOMMENDED PUMPING RATE 0010 GPM.

010.0 GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

☒ 1 WATER SUPPLY ☐ 2 OBSERVATION WELL ☐ 3 TEST HOLE ☐ 4 RECHARGE WELL ☐ 5 ABANDONED, INSUFFICIENT SUPPLY ☐ 6 ABANDONED, POOR QUALITY ☐ 7 UNFINISHED

WATER USE 01

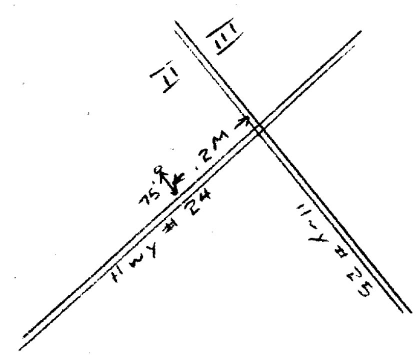
☒ 1 DOMESTIC ☐ 2 STOCK ☐ 3 IRRIGATION ☐ 4 INDUSTRIAL ☐ OTHER ☐ 5 COMMERCIAL ☐ 6 MUNICIPAL ☐ 7 PUBLIC SUPPLY ☐ 8 COOLING OR AIR CONDITIONING ☐ 9 NOT USED

METHOD OF DRILLING

☐ 1 CABLE TOOL ☒ 2 ROTARY (CONVENTIONAL) ☒ 3 ROTARY (REVERSE) ☐ 4 ROTARY (AIR) ☐ 5 AIR PERCUSSION ☐ 6 BORING ☐ 7 DIAMOND ☐ 8 JETTING ☐ 9 DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: LADCO DRILLING | LICENCE NUMBER 3316

ADDRESS: HILLSBURGH RR 4

NAME OF DRILLER OR BORER: ROY LANG | LICENCE NUMBER 3017

SIGNATURE OF CONTRACTOR: Roy Lang | SUBMISSION DATE DAY 14 MO. OCT YR. 71

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 3316 | DATE RECEIVED 110272

DATE OF INSPECTION | INSPECTOR

REMARKS: | P | WI

OWRC COPY

The Ontario Water Resources Commission Act

40P/9E

WATER WELL RECORD

Water management in Ontario 1. PRINT ONLY IN SPACES PROVIDED 2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6704436 | MUNICIP. 67003 | CON. CON 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
WELLINGTON	ERIN	2	013

[redacted] Ospringe Ont.

DATE COMPLETED DAY 17 MO. 05 YR. 72

384400 | RC. 4 | ELEVATION 1350 | RC. 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
BROWN	CLAY + STONES			0	20
GREY	CLAY + SAND LAYER-ROCKS			20	116
BROWN	LIMESTONE			116	145

31 | 0020005112 | 0116028128 | 0145015

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0143	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
~~145~~ 0145	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
04"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.205	0	~~121~~ 0121
04	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		121	~~145~~ 0145
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD 1 ☒ PUMP 2 ☐ BAILER | PUMPING RATE 0010 GPM. | DURATION OF PUMPING 02 HOURS 30 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
051 FEET	065 FEET	065 FEET	065 FEET	065 FEET	065 FEET

WATER LEVELS DURING 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE GPM. | PUMP INTAKE SET AT 80 FEET | WATER AT END OF TEST 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 080 FEET | RECOMMENDED PUMPING RATE 0007 GPM.

000.7 GPM./FT. SPECIFIC CAPACITY

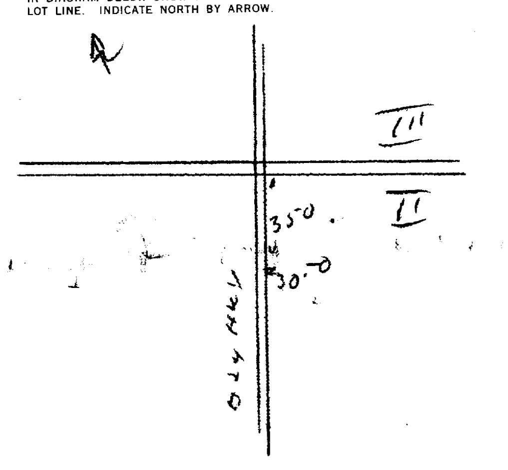
FINAL STATUS OF WELL: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING: 1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: LADCO DRILLING | LICENCE NUMBER 3316

ADDRESS: HILLSBURGH RR#1

NAME OF DRILLER OR BORER: Roy Lang | LICENCE NUMBER 3317

SIGNATURE OF CONTRACTOR: Roy Lang | SUBMISSION DATE DAY 17 MO. MAY YR. 72

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 3316 | DATE RECEIVED 271172

DATE OF INSPECTION | INSPECTOR

REMARKS: P W

CSS.S8

OWRC COPY

Ministry of the Environment

Ontario

The Ontario Water Resources Act

WATER WELL RECORD

40P/9E

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6706466 | MUNICIP. 67003 | CON. CON | 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Erin	2	014

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Knox Pres[redacted] Church	R. R. #1, Guelph	DAY 06 MO 07 YR 77

21 | ZONE 17 | EASTING 569700 | NORTHING 4838400 | RC 5 | ELEVATION 1355 | RC 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
				0	1
Black	top soil			1	4
Brown	clay			4	26
Brown	sand			26	32
Grey	mar~~s~~l				

31 | 0001802 | 0004605 | 0026628 | 0032233

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0026	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
30	1 ☒ STEEL 2 ☒ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.064	0	0032
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
	INCHES	FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
	FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER | PUMPING RATE ___ GPM | DURATION OF PUMPING ___ HOURS ___ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
021 FEET	FEET	FEET	FEET	FEET	FEET

1 ☐ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE ___ GPM | PUMP INTAKE SET AT 30 FEET | WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING 030 FEET | RECOMMENDED PUMPING RATE 0003 GPM

FINAL STATUS OF WELL 1

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 01

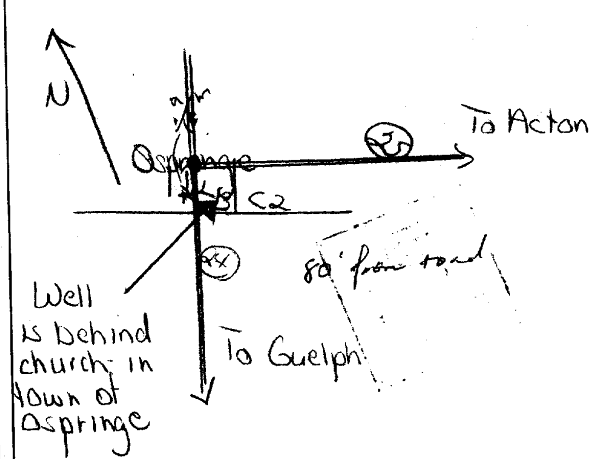
1 ☒ DOMESTIC
2 ☒ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING 6

1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☒ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR	LICENCE NUMBER
HADCO WELL DRILLING & DIGGING	2519

ADDRESS: Box 188, Elmira Ontario N3B 2Z6

NAME OF DRILLER OR BORER	LICENCE NUMBER
Mr. David Hatherton	

SIGNATURE OF CONTRACTOR: Dan Hatherton | SUBMISSION DATE DAY 11 MO 7 YR 77

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2519 | DATE RECEIVED 15-09-77

DATE OF INSPECTION Aug. 1/78 | INSPECTOR EJ

REMARKS

CSS.S8

FORM NO. 0506—4—77

MINISTRY OF THE ENVIRONMENT COPY

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

40P/9E

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6706697 MUNICIP. 67003 CON. CON 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Erin	2	9 1/4

OWNER (SURNAME FIRST): WILMORDON CONSTR. LTD
ADDRESS: RR#1 Orton Ont.
DATE COMPLETED: DAY 19 MO 06 YR 78

21 | ZONE 17 | EASTING 569750 | NORTHING 4838450 | RC 5 | ELEVATION 1350 | RC 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	Black	top soil		0	1
	Brown	sandy clay		1	4
	gravel +	stones		4	6
	Brown	sand		6	21
	grey	sand		21	29

31 0001802 | 00041605181 | 0006 11112 | 0021628 | 0029228

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0006	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
0021	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
30"	1 ☐ STEEL 2 ☒ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.064	0	~~29~~ 0029
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☒ PUMP ~~BAILER~~ | PUMPING RATE: 0002 GPM | DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
006 FEET	029 FEET	FEET	028 ~~006~~ FEET	FEET	027 ~~012~~ FEET

WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: 25 FEET
WATER AT END OF TEST: ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 025 FEET
RECOMMENDED PUMPING RATE: 0002 GPM
GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.

Follow # 24 hiway from Guelph to Ospringe just before main Intersection old ~~old~~ church with vacant lot beside it Well is in middle of lot, 100' from highway.

24 + 2.4 Ospringe
← Guelph
6/10 m 25

DRILLERS REMARKS:

FINAL STATUS OF WELL: 1

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE: 01

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING: 6

1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☒ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Paul Weber Water Wells — LICENCE NUMBER 5469
ADDRESS: RR 2 Breslau
NAME OF DRILLER OR BORER: R. Franklin — LICENCE NUMBER 5469
SIGNATURE OF CONTRACTOR: Paul Weber
SUBMISSION DATE: DAY 22 MO. 6 YR 78

OFFICE USE ONLY

260678

DATA SOURCE: 1 | CONTRACTOR: 5469 | DATE RECEIVED
DATE OF INSPECTION: Aug. 1/78 | INSPECTOR: 29
REMARKS:
P
WI
CSS S8

FORM 7 MOE 07-091

MINISTRY OF THE ENVIRONMENT COPY

40819

Ministry of the Environment

Ontario

The Ontario Water Resources Act
WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6707099 | MUNICIP 67003 | CON. CON 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY ETC.	LOT
[redacted]	[redacted]IN	II	013

[redacted] RR 1 ACTON ONT.

DATE COMPLETED DAY 30 MO 08 YR 79

21 | 17 | 567600 | 4838250 | RC 5 | ELEVATION 1375 | RC 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	clay	some stones & sand	soft.	0	40
Grey	clay		soft	40	62
Grey	clay		hard	62	118
Grey	clay	sand & boulders.	packed	118	162
Brown	limestone		fractured	162	191½

31 | 0040605 1228 | 0062205 85 | 0118205 73 | 0162205 2813 | 0192415 71

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0170	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
0188	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06¼	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0166 166½
06¼	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		166½	0192 191½
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
160	30	Bentonite & drill cuttings

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE 0090 GPM | DURATION OF PUMPING 02 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
091 FEET	190 FEET	095 FEET	092 FEET	FEET	091 FEET

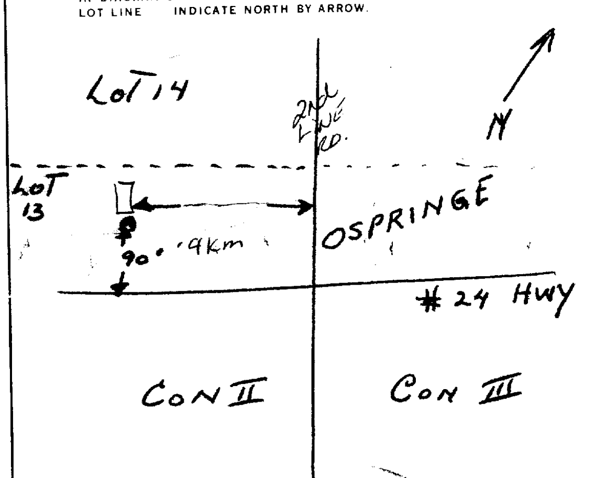
WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY

IF FLOWING, GIVE RATE — GPM | PUMP INTAKE SET AT 190 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 125 FEET | RECOMMENDED PUMPING RATE 0015 ~~15~~ GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL: 1

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE: 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING: 2

1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Don P. Jacobson | LICENCE NUMBER: 2904

ADDRESS: RR 6 Guelph Ont.

NAME OF DRILLER OR BORER: Don P. Jacobson. | LICENCE NUMBER: "

SIGNATURE OF CONTRACTOR: D.P. Jacobson. | SUBMISSION DATE DAY 31 MO Aug YR 79

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2904 | DATE RECEIVED 211179

DATE OF INSPECTION July 14, 1980 | INSPECTOR

REMARKS

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FORM NO. 0506-4-77

Ministry of the Environment

Ontario

The Ontario Water Resources Act 40P/9E

WATER WELL RECORD

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(11) 6707562 MUNICIP 67003 CON. CON 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	Erin	II	012

[redacted] R1 Guelph Ont.

DATE COMPLETED: DAY 16 MO 09 YR 81

[redacted] 538400 RC 5 ELEVATION 1325 RC 5 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	Clay, Stone, Sand Layers			0	20
Grey	Clay, Stones			20	115
	Clay, Gravel Layers			115	142
Br.	Limestone			142	147

31: 0020605 1228 | 0115 2051 2 | 0142 05 1174 | 0147 6 15

32:

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0146 147	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
05"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0144
05"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		144	0147
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐	0010 GPM	12 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
080 FEET	083 FEET	083 FEET	083 FEET	083 FEET	083 FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: 100 FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

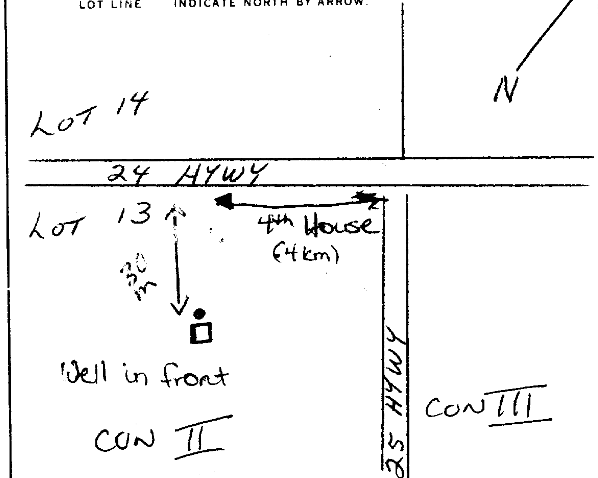
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 110 FEET

RECOMMENDED PUMPING RATE: 0010 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL: 1

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE: 01

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING: 2

1 ☐ CABLE TOOL
2 ☒ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Lang Well Drilling Ltd — LICENCE NUMBER 3317

ADDRESS: RR1 Hillsburgh Ont

NAME OF DRILLER OR BORER: Roy LANG — LICENCE NUMBER 3317

SIGNATURE OF CONTRACTOR: Roy Lang — SUBMISSION DATE: DAY 16 MO 9 YR 81

OFFICE USE ONLY

DATA SOURCE: 1 — CONTRACTOR: 3317 — DATE RECEIVED: 20 01 82

DATE OF INSPECTION — INSPECTOR: KM

REMARKS

CSS.S8

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FORM NO. 0506-4-77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

6709054

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11

MUNICIP | CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	Erin	II	14

[redacted] 1265 Wilson Ave., Apt. 114, [redacted] Ont. M3M 1J9

DATE COMPLETED: DAY 01 MO 12 YR 87

ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Br.	Clay	Stones		0	20
Gr.	Clay	Stones		20	99
Br.	Rock			99	163
Br./Gr.	Rock			163	174
Gr.	Limestone			174	186

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
183	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
5"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	104
5"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		104	186
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: AIR — 1 ☐ PUMP 2 ☐ BAILER
PUMPING RATE: 12 GPM
DURATION OF PUMPING: 1 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
78 FEET	87 FEET	87 FEET	87 FEET	87 FEET	87 FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 120 FEET
RECOMMENDED PUMPING RATE: 10 GPM

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED
9 ☐ DEWATERING

WATER USE

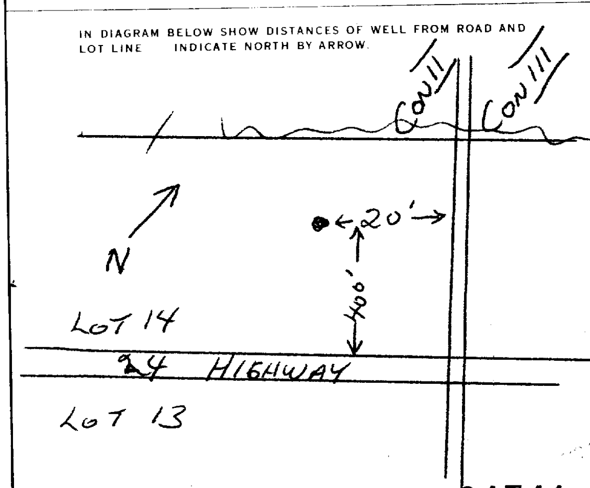
1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL
2 ☒ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING
☐ DIGGING
☐ OTHER

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



24741

DRILLERS REMARKS: T.W.C. 25

CONTRACTOR

NAME OF WELL CONTRACTOR: LANG WELL DRILLING LTD.
WELL CONTRACTOR'S LICENCE NUMBER: 3317
ADDRESS: R.R. 1 HILLSBURGH ONT.
NAME OF WELL TECHNICIAN: ROY LANG
WELL TECHNICIAN'S LICENCE NUMBER: T-0158
SIGNATURE OF TECHNICIAN/CONTRACTOR: R. Lang
SUBMISSION DATE: DAY 12 MO. 01 YR 88

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: JAN 13 1988
DATE OF INSPECTION | INSPECTOR
REMARKS

CSS.ES

Ministry of the Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
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11 | 6709569 | MUNICIP 67003 | CON. CON 03

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC	LOT
[redacted]	[redacted]	III	14

DATE COMPLETED: DAY 12 MO 09 YR 88

[redacted] | RC | ELEVATION | RC | BASIN CODE | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Br.	Clay			0	10
Br.	Clay	Stones		10	17
Gr.	Clay	Stones		17	90
Gr.	Clay	Rocks		90	95
Gr./Br.	Limestone			95	102
Br.	Limestone			102	155
Dk. Br.	Rock			155	170
Gr. Br.	Rock			170	185

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
175 TO 185'	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	99
5	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		99	185
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: AIR — 1 ☐ PUMP 2 ☐ BAILER
PUMPING RATE: 10 GPM
DURATION OF PUMPING: 1 HOURS 30 MINS

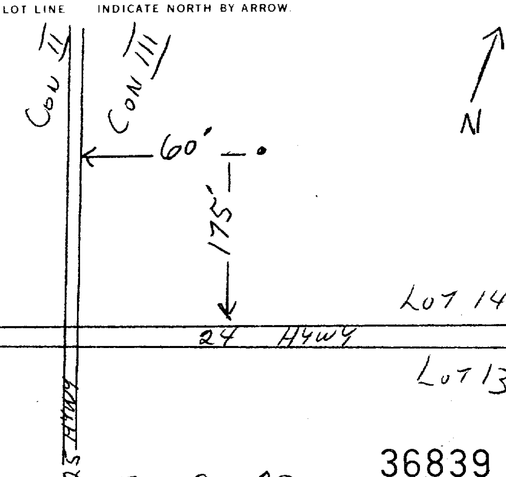
STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
45 FEET	75 FEET	75 FEET	75 FEET	75 FEET	75 FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 100 FEET
RECOMMENDED PUMPING RATE: 10 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



36839

DRILLERS REMARKS: T.W.C. 20

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED
9 ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL
2 ☒ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING
☐ DIGGING
☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Lang Well Drilling Ltd
WELL CONTRACTOR'S LICENCE NUMBER: 3317
ADDRESS: R.R. #1 Hillsburgh Ont.
NAME OF WELL TECHNICIAN: ROY LANG
WELL TECHNICIAN'S LICENCE NUMBER: T-0158
SIGNATURE OF TECHNICIAN/CONTRACTOR: R. Lang
SUBMISSION DATE: DAY 10 MO. 02 YR. 89

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 3317 | DATE RECEIVED FEB 10 1989
DATE OF INSPECTION | INSPECTOR
REMARKS
WDE
CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6709897 | MUNICIP 67003 | CON. CON. 03

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	Erin	III	14

DATE COMPLETED: DAY 04 MO 04 YR 89

[redacted] | RC | ELEVATION | RC | BASIN CODE | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Br.	Clay	Stones		0	18
Gr.	Clay	Stones		18	93
Gr.	Limestone			93	100
Br.	Limestone			100	220

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
190	1 ☒ FRESH
195	1 ☒ FRESH

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5"	1 ☒ STEEL	.188	0	100
5"	4 ☒ OPEN HOLE		100	220

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

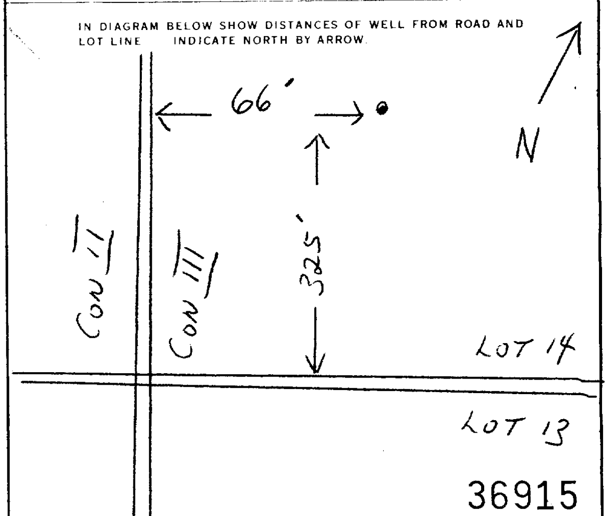
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	AIR
PUMPING RATE	9 GPM
DURATION OF PUMPING	1 HOURS 30 MINS
STATIC LEVEL	53 FEET
WATER LEVEL END OF PUMPING	80 FEET
WATER LEVELS DURING	1 ☒ PUMPING
15 MINUTES	80 FEET
30 MINUTES	80 FEET
45 MINUTES	80 FEET
60 MINUTES	80 FEET
IF FLOWING, GIVE RATE	GPM
PUMP INTAKE SET AT	FEET
WATER AT END OF TEST	1 ☒ CLEAR
RECOMMENDED PUMP TYPE	☒ DEEP
RECOMMENDED PUMP SETTING	135 FEET
RECOMMENDED PUMPING RATE	9 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



36915

DRILLERS REMARKS

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY
WATER USE	1 ☒ DOMESTIC
METHOD OF CONSTRUCTION	2 ☒ ROTARY (CONVENTIONAL)

CONTRACTOR

NAME OF WELL CONTRACTOR: Lang Well Drilling Ltd
WELL CONTRACTOR'S LICENCE NUMBER: 3317
ADDRESS: R.R.1 Hillsburgh Ont.
NAME OF WELL TECHNICIAN: Roy Lang
WELL TECHNICIAN'S LICENCE NUMBER: T-0158
SIGNATURE OF TECHNICIAN/CONTRACTOR: R. Lang
SUBMISSION DATE: DAY 03 MO. 08 YR 89

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 3317 | DATE RECEIVED AUG 14 1989
DATE OF INSPECTION | INSPECTOR
REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 | 6713028 | Municipality 67003 | Con. CON 02

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
WELLINGTON	ERIN	2	13

[redacted]

Address: R.R.#3 ACTON ONT. L7J 2L9
Date completed: 06 day 07 month 99 year

21 | Northing | RC | Elevation | RC | Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	To
BROWN	CLAY	STONES, GRAVEL		0	20
GREY	CLAY			20	55
GREY	CLAY	GRAVEL		55	100
LIGHT BROWN	LIMESTONE			100	115
MED. BROWN	LIMESTONE			115	143
			TOTAL = 143 FT.		
		6" CASING DRIVE SHOE			

31
32

WATER RECORD (41)

Water found at – feet	Kind of water
85	☑ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
143	☑ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas

CASING & OPEN HOLE RECORD (51)

Inside diam inches	Material	Wall thickness inches	Depth – feet From	To
6"	☑ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	.188	+2	100
6"	☐ Steel ☐ Galvanized ☐ Concrete ☑ Open hole ☐ Plastic		100	143
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			

SCREEN

Sizes of opening (Slot No.) | Diameter inches | Length feet
Material and type | Depth at top of screen feet

PLUGGING & SEALING RECORD (61)

☑ Annular space ☐ Abandonment

Depth set at – feet From	To	Material and type (Cement grout, bentonite, etc.)
0	20	BENSEAL

PUMPING TEST (71)

Pumping test method: ☑ Pump ☐ Bailer
Pumping rate: 12 GPM
Duration of pumping: 1 Hours ... Mins

Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
65 feet	120 feet	80 feet	100 feet	115 feet	120 feet

Water levels during: ☑ Pumping ☐ Recovery
If flowing give rate: GPM
Pump intake set at: feet
Water at end of test: ☑ Clear ☐ Cloudy
Recommended pump type: ☐ Shallow ☑ Deep
Recommended pump setting: 130 feet
Recommended pump rate: 12 GPM

FINAL STATUS OF WELL

☑ Water supply ☐ Observation well ☐ Test hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Abandoned (Other) ☐ Dewatering ☐ Unfinished ☐ Replacement well

WATER USE

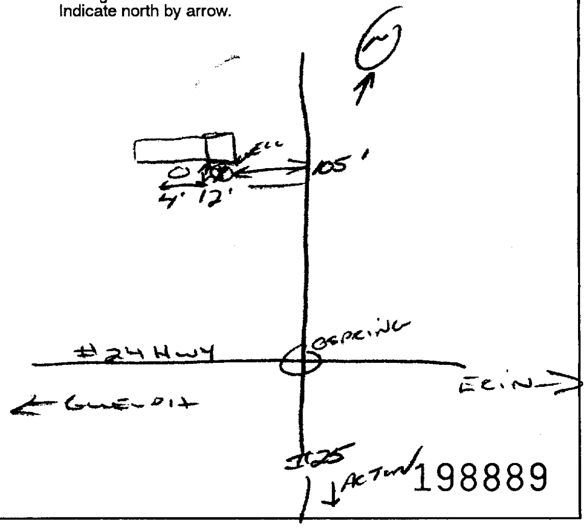
☑ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public supply ☐ Cooling & air conditioning ☐ Not used ☐ Other

METHOD OF CONSTRUCTION

☐ Cable tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☑ Rotary (air) ☐ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



198889

Name of Well Contractor	Well Contractor's Licence No.
Hannam Well Drilling Ltd.	2663

Address: RR #5 GUELPH N1H 6J2

Name of Well Technician	Well Technician's Licence No.
Harry R Hannam	T 0550

Signature of Technician/Contractor | Submission date: 08 mo 99 yr

MINISTRY USE ONLY

Data source | Contractor 2663 | Date received AUG 05 1999
Date of inspection | Inspector
Remarks

2 – MINISTER OF ENVIRONMENT & ENERGY COPY

0506 (07/94) Front Form 9

Ontario Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 | **6713694** | Municipality 67003 | Con. CON 02

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Wellington	Erin	2	14

Owner's surname	First Name	Address	Date completed
Civicro	Construction	RR #1 Rockwood Ont.	18 day 06 month 01 year

21 | Zone | Easting | Northing | RC | Elevation | RC | Basin Code | ii | iii | iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Light Brown	Clay			0	85
Light Brown	Clay	Gravel		85	97
Biege	Limestone			97	130
Dark Brown	Limestone			130	142
			Total = 142 Ft.		
		6 1/4" Casing Drive Shoe			

31

32

41 WATER RECORD

Water found at - feet	Kind of water
130	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
142	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+2	97
6 1/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		97	142
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet
Material and type		Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
0	20	Benseal

71 PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
1 ☑ Pump 2 ☐ Bailer	20 GPM	1 Hours Mins

Static level	Water level end of pumping	Water levels during 1 ☑ Pumping 2 ☐ Recovery: 15 minutes	30 minutes	45 minutes	60 minutes
65 feet	81 feet	80 feet	81 feet	81 feet	81 feet

If flowing give rate	Pump intake set at	Water at end of test
GPM	feet	☑ Clear ☐ Cloudy

Recommended pump type	Recommended pump setting	Recommended pump rate
☐ Shallow ☑ Deep	90 feet	20 GPM

FINAL STATUS OF WELL

1 ☑ Water supply
2 ☐ Observation well
3 ☐ Test hole
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE

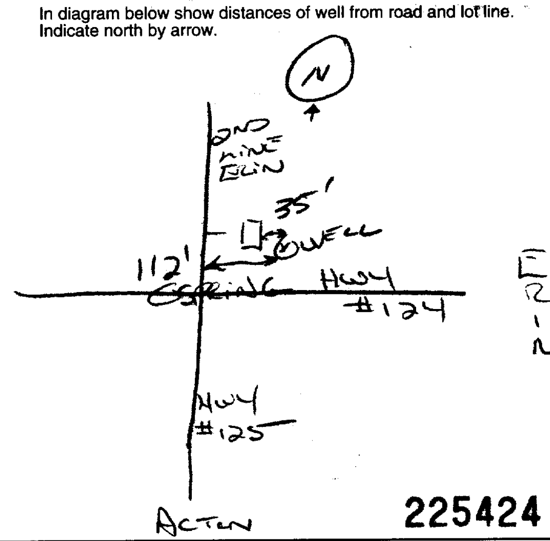
1 ☑ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool
2 ☐ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☑ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



225424

Name of Well Contractor	Well Contractor's Licence No.
Dawson Well Drilling Ltd	2663
Address: RR #5 Guelph N1H 6J2	
Name of Well Technician: John Whitney	Well Technician's Licence No. T-2790
Signature of Technician/Contractor	Submission date 27 06 01 (day mo yr)

MINISTRY USE ONLY

Data source	Contractor 2663	Date received JUN 28 2001
Date of inspection	Inspector	
Remarks	CSS.ES1	

2 - MINISTRY OF THE ENVIRONMENT COPY

0506 (07/00) Front Form 9

Ontario | Ministry of the Environment

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag#: A152130

Well Record

Regulation 903 Ontario Water Resources Act

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
8906 Wellington Rd 124	Erin	14	3

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Ospringe	Ontario	N1H6H7

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	569797	4838803		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Clay + stones			0	5.48
Gray	Clay + stones			5.48	26.51
Brown	limestone			26.51	51.20
Gray	limestone			51.20	60.04

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	10	Bentonite Grout	.75

Method of Construction

☐ Cable Tool ☐ Diamond ☒ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☒ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
15.9	steel	.48	+.70	27.12
15.6	open hole		27.12	60.04

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Results of Well Yield Testing

After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 30

Pumping rate (l/min / GPM): 13 US

Duration of pumping: 1 hrs + ___ min

Final water level end of pumping (m/ft): 21.38

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 30

Recommended pump rate (l/min / GPM): 10 US

Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	16.20		21.38
1	17.79	1	19.40
2	18.49	2	18.77
3	18.96	3	18.35
4	19.30	4	18.05
5	15.55	5	17.86
10	20.22	10	17.36
15	20.41	15	17.20
20	20.79	20	16.99
25	20.94	25	16.86
30	21.03	30	16.76
40	21.20	40	16.70
50	21.30	50	16.57
60	21.38	60	16.47

Water Details

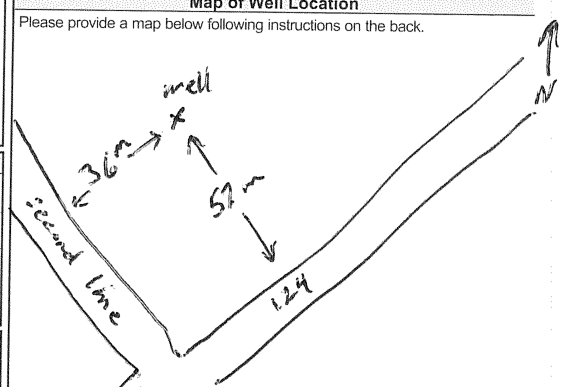
Water found at Depth	Kind of Water
51 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify
60 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	27.12	22.8
27.12	60.04	15.6

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Well Initiatives

Well Contractor's Licence No.: 7221

Business Address (Street Number/Name): 15 Town line

Municipality: Orangeville

Province: ON

Postal Code: L9W3R4

Business E-mail Address: info@wellinitiatives.com

Bus.Telephone No. (inc. area code): 5198468289

Name of Well Technician (Last Name, First Name): Losch Kim

Well Technician's Licence No.: T927

Signature of Technician and/or Contractor: [signature]

Date Submitted: 20140716

Well owner's information package delivered: ☐ Yes ☒ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 20140711

Ministry Use Only

Audit No. Z188903

Received JUL 23 2014

Ministry's Copy

Ontario Ministry of the Environment

Well Record

Well Tag No. (Place sticker and/or print below) 157997

Tag#: A157997

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☐ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
GM BLUE PLAN ENGINEERING LIMITED	THOMASFIELD HOMES LTD		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
650 WOODLAWN RD WEST BLOC C UNIT 2	GUELPH	ONT	N1K1B8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	ERIN	13	2

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINTON		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	569682	4838446		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BROWN	CLAY & STONES			0	27ft
GRAY	CLAY & STONES			27ft	124ft
BROWN	LIMESTONE			124ft	135ft
GRAY	LIMESTONE			135ft	142ft

TW-1

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	129ft	BENTONITE SLURRY 90gal	

Method of Construction

☐ Cable Tool ☐ Diamond ☒ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☒ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6¼	steel	.188	0	129ft
6in	open hole		129ft	142ft

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Water Details

Water found at Depth 136ft (m/ft) Kind of Water: ☒ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Water found at Depth (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Water found at Depth (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	129ft	8.75in
129ft	142ft	6in

Results of Well Yield Testing

After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason: Pump test DONE BY ENGINEER

Pump intake set at (m/ft): 100ft

Pumping rate (l/min / GPM): 20gpm

Duration of pumping: 2 hrs + 0 min

Final water level end of pumping (m/ft): 85ft

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 100 ft

Recommended pump rate (l/min / GPM): 20gpm

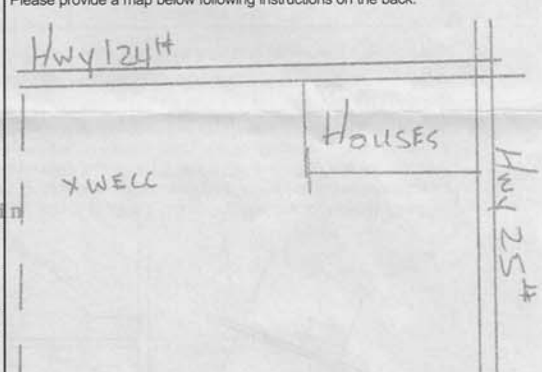
Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	82ft		
1		1	
2		2	
3		3	
4		4	
5	83ft	5	83ft
10		10	
15		15	
20		20	
25		25	
30		30	82ft
40		40	
50		50	
60	84ft	60	82ft

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
KEITH LANG WELL DRILLING INC	7154

Business Address (Street Number/Name)	Municipality
251 ELDON ST GODERICH	

Province	Postal Code	Business E-mail Address
ONT	N7A3R9	

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	KEITH LANG

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T446	K. Lang	

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: YYYYMMDD

Date Work Completed: 2015 9 24

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Audit No. Z198072

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Well Owner's Copy

Ontario | Ministry of the Environment

Well Tag No. (Place Sticker and/or Print ...) 173609 **Tag#: A173609**

Well Record

Regulation 903 Ontario Water Resources Act

Page ______ of ______

Measurements recorded in: ☐ Metric ☐ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
GM BLUE PLAN ENGINEERING LIMITED	THOMASFIELD HOME LTD		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
650 WOODLAWN RD WEST BLOC C UNIT 2	GUELPH	ONT	N1K1B8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	ERIN	13	2

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	569853	4838636		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BROWN	CLAY & STONES			0	32ft
GRAY	CLAY & STONES			32ft	94ft
BROWN	LIMESTONE			94ft	139ft
GRAY	DIMESTONE			139ft	200ft

TW-2

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	101ft	BENTONITE SLURRY	75gal

Method of Construction

☐ Cable Tool ☐ Diamond ☒ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☒ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6¼	steel	.188	0	101ft
6in	op½en hole		101ft	200ft

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Water Details

Water found at Depth (m/ft)	Kind of Water
138ft	☒ Fresh ☐ Untested ☐ Gas ☐ Other, specify
192ft	☒ Fresh ☐ Untested ☐ Gas ☐ Other, specify
	☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	101ft	8.75in
101ft	200ft	6in

Results of Well Yield Testing

After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason: Pump test DONE BY Engineer.

Pump intake set at (m/ft): 120ft

Pumping rate (l/min / GPM): 20gpm

Duration of pumping: 24 hrs + ___ min

Final water level end of pumping (m/ft): 97ft

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 120ft

Recommended pump rate (l/min / GPM): 20gpm

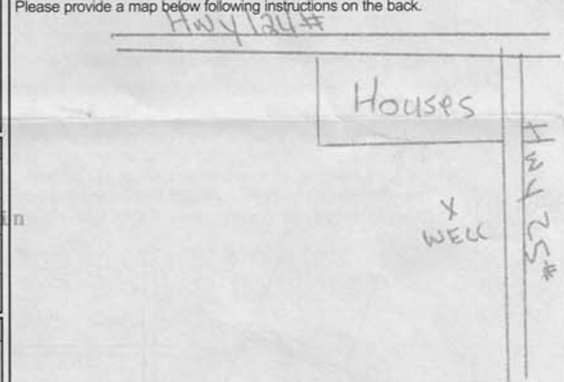
Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	82ft		
1		1	
2		2	
3		3	
4		4	
5	89ft	5	85ft
10	93ft	10	83ft
15	95ft	15	82ft
20		20	
25		25	
30	96ft	30	
40		40	
50		50	
60	97ft	60	82ft

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
KEITH LANG WELL DRILLING INC	7154

Business Address (Street Number/Name)	Municipality
251 ELDON ST GODERICH	

Province	Postal Code	Business E-mail Address
ONT	N7A3R9	

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	KEITH LANG

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T446	K. Lang	Y Y Y Y M M D D

Well owner's information package delivered ☐ Yes ☒ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2015 9 25

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Audit No. Z 198071

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  Well Owner's Copy

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)* 173608 **Tag#: A173608**

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☐ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
GM BLUE PLAN ENGINEERING LIMITED	THOMASFEILD HOMES LTD		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
650 WOODLAWN RD WEST BLOC C UNIT 2	GUELPH	ONT	N1K1B8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	erin	13	2

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	570048	4838305		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

TW-3

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	CLAY & STONES			0	36ft
GRAY	CLAY AND STONES			36ft	106ft
BROWN	LIMESTONE			106ft	139ft
GRAY	LIMESTONE			139ft	162ft

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	112ft	BENTONITE SLURRY	75gal

Results of Well Yield Testing

After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason: pumptestdone by engineers

Pump intake set at (m/ft): 100ft

Pumping rate (l/min / GPM): 20gpm

Duration of pumping: 8 hrs + 0 min

Final water level end of pumping (m/ft): 72ft

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 100ft

Recommended pump rate (l/min / GPM): 20gpm

Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	48ft		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15	68ft	15	
20		20	
25		25	
30	70ft	30	
40	71ft	40	
50		50	
60	72ft	60	

Method of Construction

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Other, specify ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☒ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify ☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning ☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6¼	steel	.188	0	112ft
6in	open hole		112ft	162ft

Status of Well

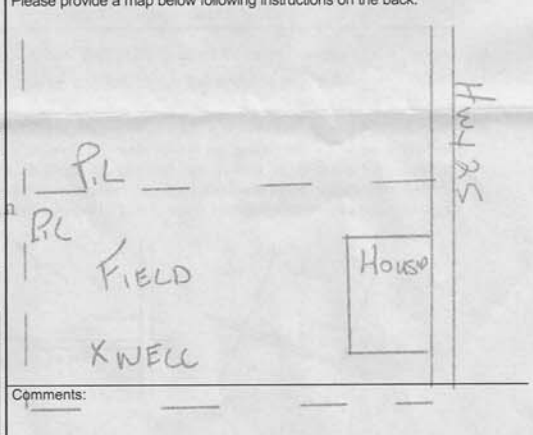
☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Water Details

Water found at Depth	Kind of Water
155ft (m/ft)	☒ Fresh ☐ Untested ☐ Gas ☐ Other, specify
(m/ft)	☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify
(m/ft)	☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	112ft	8.75in
112ft	162ft	6in

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
KEITH LANG WELL DRILLING INC	7154

Business Address (Street Number/Name)	Municipality
251 ELDON ST GODERICH	

Province	Postal Code	Business E-mail Address
ONT	N7A3R9	

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	KEITH LANG

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T446	K. Lang	YYYYMMDD

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No	YYYYMMDD	2015 9 27

Ministry Use Only

Audit No. Z198070

Received

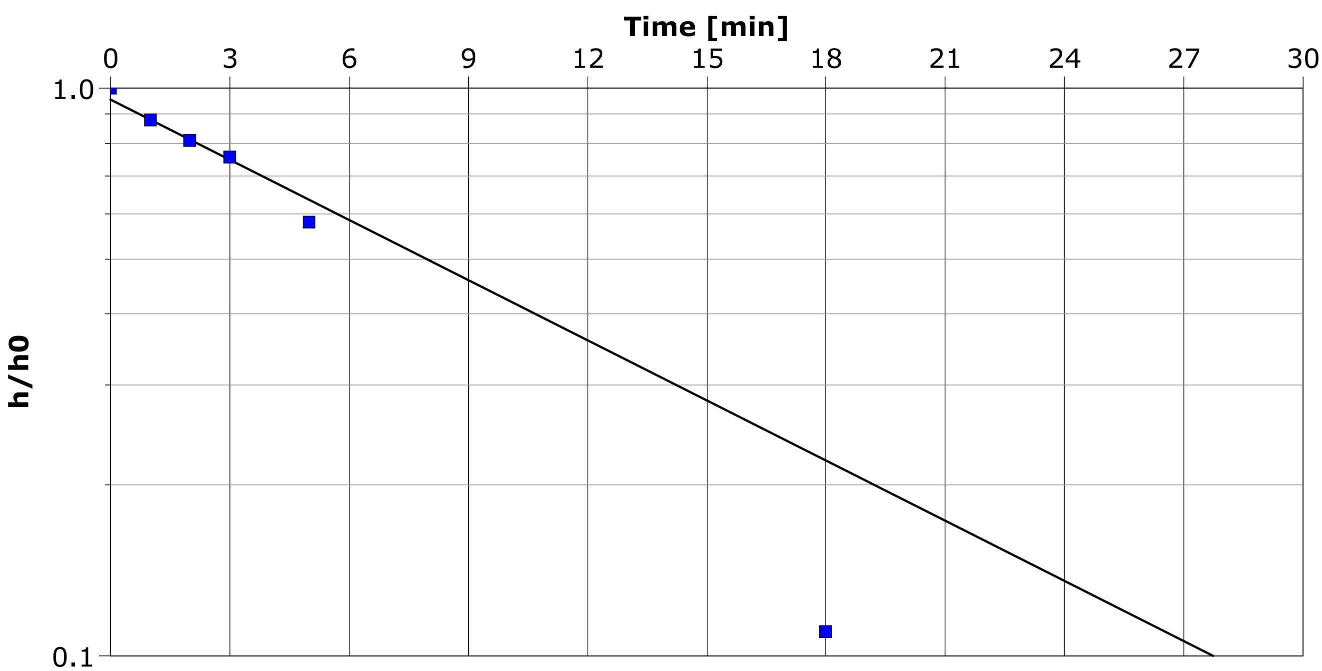
APPENDIX E
Well Response Test Analyses & Thomasfield Test Well Aquifer Parameters

	Slug Test - Water Level Data
	Project: Ospringe Development
	Number: H16051
	Client:

Location: Ospringe, Erin Twp	Slug Test: BH4	Test Well: BH4
Test Conducted by: L Curnow	Test Date: 11/05/2018	
Water level at t=0 [m]: 2.77	Static Water Level [m]: 1.91	Water level change at t=0 [m]: 0.86

	Time [min]	Water Level [m]	WL Change [m]
1	0	2.77	0.86
2	1	2.665	0.755
3	2	2.605	0.695
4	3	2.56	0.65
5	5	2.41	0.50
6	18	2.005	0.095

Analysis Performed by: L Curnow	BH4	Analysis Date: 29/05/2018
Aquifer Thickness: 6.00 m		



Calculation using Bouwer & Rice

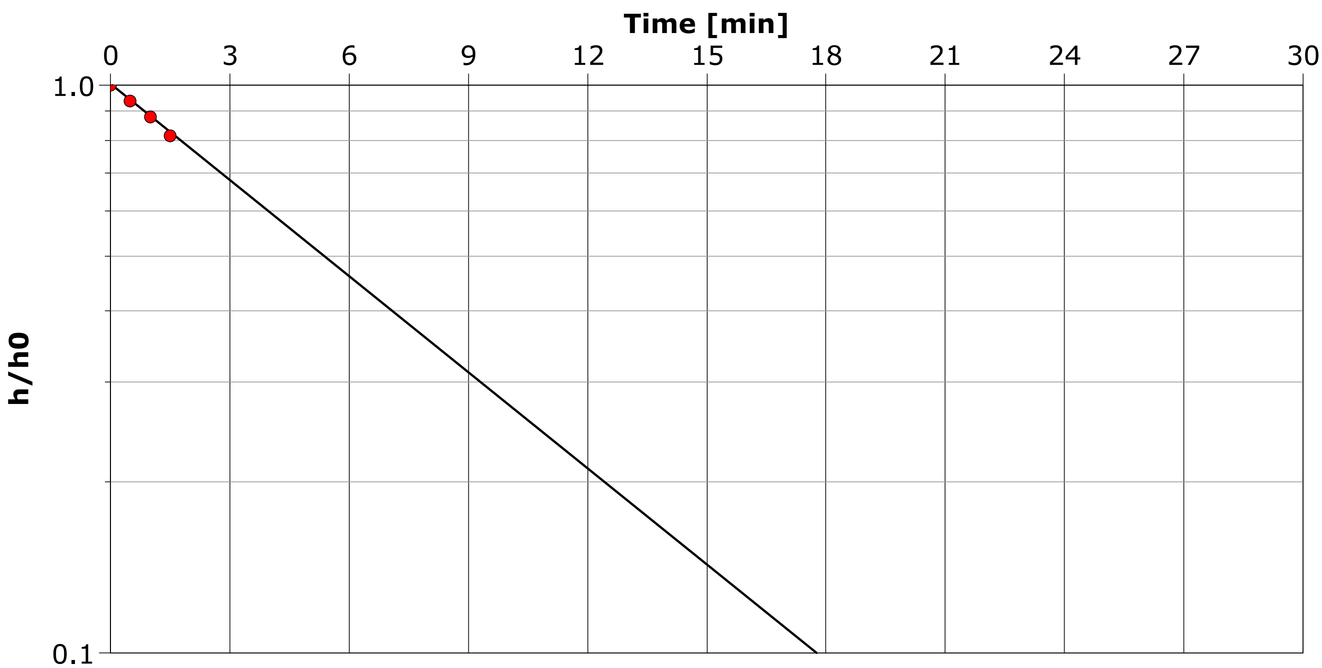
Observation Well	Hydraulic Conductivity [m/s]
BH4	3.84×10^{-7}

	Slug Test - Water Level Data Page 1 of 1
	Project: Ospringe Development
	Number: H16051
	Client:

Location: Ospringe, Erin Twp	Slug Test: BH5	Test Well: BH5
Test Conducted by: L Curnow	Test Date: 11/05/2018	
Water level at t=0 [m]: 6.50	Static Water Level [m]: 2.07	Water level change at t=0 [m]: 4.43

	Time [min]	Water Level [m]	WL Change [m]
1	0	6.50	4.43
2	0.5	6.22	4.15
3	1	5.96	3.89
4	1.5	5.68	3.61

Analysis Performed by: L Curnow	BH5	Analysis Date: 29/05/2018
Aquifer Thickness: 6.00 m		



Calculation using Bouwer & Rice

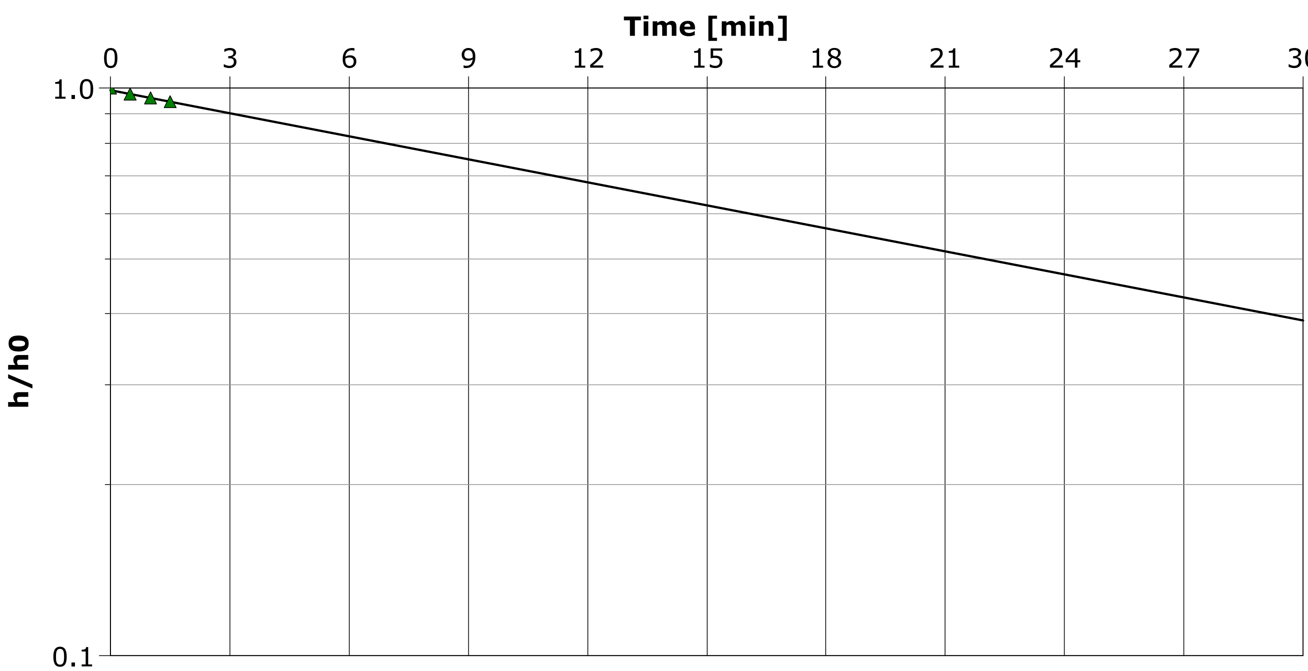
Observation Well	Hydraulic Conductivity [m/s]
BH5	7.11×10^{-7}

Slug Test - Water Level Data	Page 1 of 1
Project: Ospringe Development	
Number: H16051	
Client:	

Location: Ospringe, Erin Twp	Slug Test: BH6	Test Well: BH6
Test Conducted by: L Curnow	Test Date: 11/05/2018	
Water level at t=0 [m]: 4.12	Static Water Level [m]: 1.33	Water level change at t=0 [m]: 2.79

	Time [min]	Water Level [m]	WL Change [m]
1	0	4.12	2.79
2	0.5	4.05	2.72
3	1	4.01	2.68
4	1.5	3.97	2.64

Analysis Performed by: L Curnow	BH6	Analysis Date: 29/05/2018
Aquifer Thickness: 6.00 m		



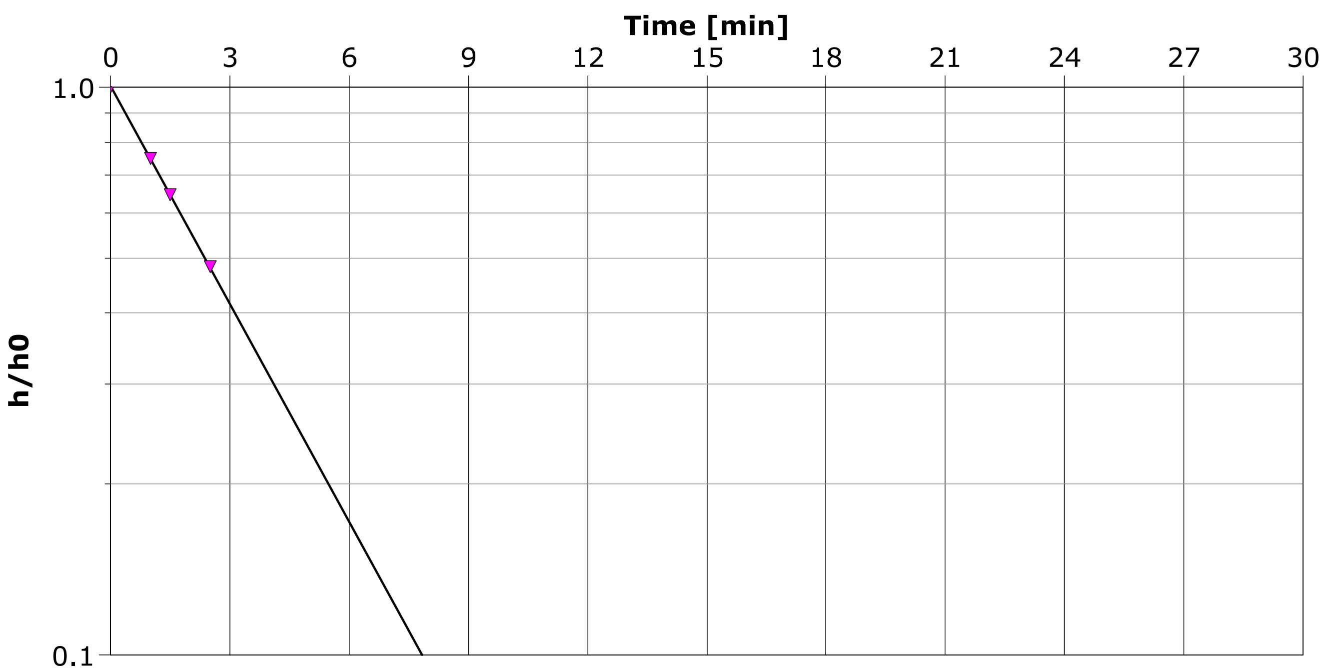
Calculation using Bouwer & Rice		
Observation Well	Hydraulic Conductivity [m/s]	
BH6	1.52×10^{-7}	

Slug Test - Water Level Data	Page 1 of 1
Project: Ospringe Development	
Number: H16051	
Client:	

Location: Ospringe, Erin Twp	Slug Test: BH3	Test Well: BH3
Test Conducted by: L Curnow	Test Date: 11/05/2018	
Water level at t=0 [m]: 4.06	Static Water Level [m]: 1.51	Water level change at t=0 [m]: 2.55

	Time [min]	Water Level [m]	WL Change [m]
1	0	4.06	2.55
2	1	3.42	1.91
3	1.5	3.16	1.65
4	2.5	2.74	1.23

Analysis Performed by: L Curnow	BH3	Analysis Date: 29/05/2018
Aquifer Thickness: 6.00 m		



Calculation using Bouwer & Rice

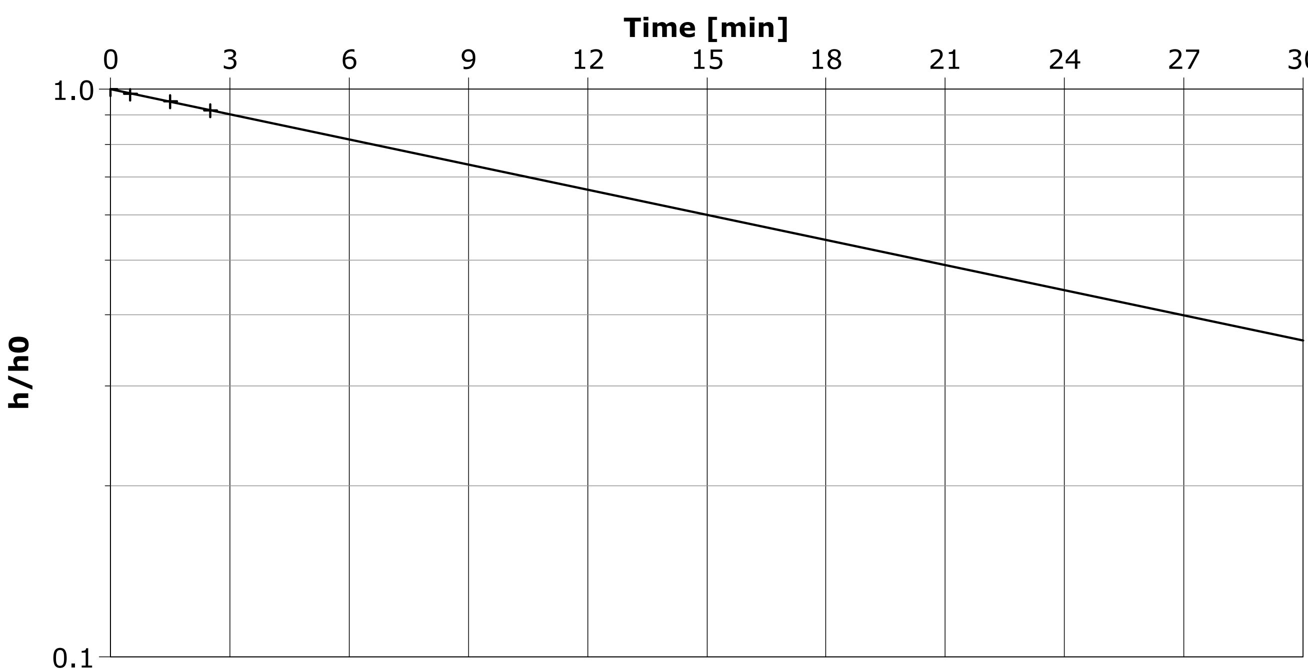
Observation Well	Hydraulic Conductivity [m/s]
BH3	1.43×10^{-6}

Slug Test - Water Level Data	Page 1 of 1
Project: Ospringe Development	
Number: H16051	
Client:	

Location: Ospringe, Erin Twp	Slug Test: BH2	Test Well: BH2
Test Conducted by: L Curnow	Test Date: 11/05/2018	
Water level at t=0 [m]: 4.71	Static Water Level [m]: 1.45	Water level change at t=0 [m]: 3.26

	Time [min]	Water Level [m]	WL Change [m]
1	0	4.71	3.26
2	0.5	4.65	3.20
3	1.5	4.55	3.10
4	2.5	4.44	2.99

Analysis Performed by: L Curnow	BH2	Analysis Date: 29/05/2018
Aquifer Thickness: 6.00 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH2	1.66×10^{-7}	

Table 6: Summary of Aquifer Supply Characteristics

Observation Well	Test Well	T	S	H_A
	(--)	(m^2/s)	(--)	(m)
TW-1	TW-2	1.19E-03	1.11E-04	13.2
	TW-3	3.08E-03	1.25E-04	13.2
TW-2	TW-1	1.10E-03	1.09E-04	13.1
	TW-3	3.22E-04	4.05E-05	13.1
TW-3	TW-1	6.13E-03	3.00E-04	18.2
	TW-2	5.13E-04	5.33E-05	18.2

Q_t: Discharge flow rate during pumping test

T: Transmissivity of the Bedrock Aquifer

S: Storativity of Bedrock Aquifer

H_A: Available Drawdown, height of water column above the top of the aquifer.

APPENDIX F
ALS Laboratory Analysis Report
& Thomasfield Test Well Quality

CHUNG AND VANDER DOELEN
ATTN: SANDY ANDERSON
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Date Received: 12-MAY-18
Report Date: 17-MAY-18 14:20 (MT)
Version: FINAL

Client Phone: 519-742-8979

Certificate of Analysis

Lab Work Order #: L2093493

Project P.O. #: NOT SUBMITTED
Job Reference: H16051 - OSPRINGE
C of C Numbers: 17-626973
Legal Site Desc:

Mary-Lynn Pike
Client Services Supervisor

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2093493-1 BH1 Sampled By: SA on 11-MAY-18 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	14.0		0.50	mg/L		15-MAY-18	R4045966
Nitrate (as N)	3.01		0.020	mg/L		15-MAY-18	R4045966
L2093493-2 BH2 Sampled By: SA on 11-MAY-18 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	19.1		0.50	mg/L		15-MAY-18	R4045966
Nitrate (as N)	4.47		0.020	mg/L		15-MAY-18	R4045966
L2093493-3 BH4 Sampled By: SA on 11-MAY-18 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	3.82		0.50	mg/L		15-MAY-18	R4045966
Nitrate (as N)	4.86		0.020	mg/L		15-MAY-18	R4045966
L2093493-4 BH5 Sampled By: SA on 11-MAY-18 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	3.13		0.50	mg/L		15-MAY-18	R4045966
Nitrate (as N)	0.197		0.020	mg/L		15-MAY-18	R4045966

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Table 4: Bedrock Groundwater Quality Analyses

	Sample ID	TW-1-01	TW-2-01	TW-2-02	TW-3-01
	Sample Description	Groundwater	Groundwater	Groundwater	Groundwater
	Screened Interval (m asl)	372.4-376.4	345.0-375.2	345.0-375.2	355.5-370.8
	Sampling Date	2015-09-17	2015-09-17	2015-09-17	2015-09-17
Various Parameters in Groundwater	**Criteria**	**Concentration**			
Calculated TDS (mg/L)	500	200	190	190	200
Hardness (CaCO3) (mg/L)	80:100	180	160	170	160
Colour (TCU)	5	2	<2	<2	5
Conductivity (umho/cm)	NV	360	340	340	340
pH (pH)	6.5:8.5	7.89	7.86	7.95	8.09
Dissolved Sulphate (SO4) (mg/L)	500	9.5	6.5	6.7	7.3
Turbidity (NTU)	5	16	1.8	0.9	33
Dissolved Chloride (Cl) (mg/L)	250	1.8	1.9	1.6	1.2
Nitrite (N) (mg/L)	**1**	<0.010	<0.010	<0.010	<0.010
Nitrate (N) (mg/L)	**10**	<0.10	<0.10	<0.10	<0.10
Nitrate + Nitrite (N) (mg/L)	**10**	<0.10	<0.10	<0.10	<0.10
Dissolved Iron (Fe) (ug/L)	300	<100	<100	<100	<100
Dissolved Manganese (Mn) (ug/L)	50	200	18	15	73
Dissolved Sodium (Na) (ug/L)	**20000**(200000)	11000	12000	13000	16000
Dissolved Organic Carbon (mg/L)	5	1.4	0.69	0.66	1
Fecal coliform (CFU/100mL)	NV	0	0	0	0
Total Coliforms (CFU/100mL)	**0**	**NDOGT**	0	NDOGN	NDOGN
Escherichia coli (CFU/100mL)	**0**	**NDOGT**	0	NDOGN	NDOGN

Notes:

1. Criteria are from the Ontario Drinking Water Objectives (2002). Criteria are indicated by:
Underlined for Aesthetic Objective, **Bold** for Maximum Acceptable Concentration, *Italics* for Interim Maximum Acceptable Concentration
2. Concentrations are as listed for each given parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. Screened well intervals presented are approximate.
5. ---- represents sample parameters that were not analyzed; NV = No value specified.
6. Maxxam Laboratory job number: B5I8843

APPENDIX G
Pre-Development Water Balance

Appendix G - Detailed Pre-Development Water Balance Calculations

Precipitation: Waterloo-Wellington Normals, Vegitation: Mix Cultivated and Pasture, Soil: Sand/Silt Loam
(by Water Balance Method, Thornthwaite & Mather, 1957)

	Units	**Annual**	**% of Total**	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Temperature	deg C			-7.3	-6.8	-1.5	5.8	12.5	17.0	19.9	18.7	14.3	8.0	2.5	-4.0
Heat Index (i)	-			0.00	0.00	0.00	1.25	4.00	6.38	8.10	7.37	4.91	2.04	0.35	0.00
UPET (unadjusted PET)	mm/day			0.00	0.00	0.00	0.90	1.98	2.71	3.19	2.99	2.27	1.25	0.38	0.00
latitude correction (r)	-			24.3	24.4	30.6	33.6	38	38.6	38.9	36	31.2	28.5	24.1	22.9
PET (Potential ET)	mm	**557.3**		0.0	0.0	0.0	30.2	75.1	104.7	124.1	107.7	70.8	35.6	9.1	0.0
Precipitation	mm	**917.0**		54.3	55.6	72.7	72.6	76.3	79.5	90.4	93.3	89.6	70.4	83.1	79.2
P - PET	mm			54.3	55.6	72.7	42.4	1.2	-25.2	-33.7	-14.4	18.8	34.8	74.0	79.2
Accum. Water Loss	mm							0.0	-25.2	-58.8	-73.2				
Moisture Retention (Storage)	mm			250.0	250.0	250.0	250.0	250.0	226.0	196.0	186.0	204.8	239.6	250.0	250.0
Storage Change	mm			0.0	0.0	0.0	0.0	0.0	-24.0	-30.0	-10.0	18.8	34.8	10.4	0.0
AET (Actual ET)	mm	**548.0**	**59.8**	0.0	0.0	0.0	30.2	75.1	103.5	120.4	103.3	70.8	35.6	9.1	0.0
Surplus / Deficit	mm	**369.0**	**40.2**	54.3	55.6	72.7	42.4	1.2	-24.0	-30.0	-10.0	18.8	34.8	74.0	79.2

Summary of Pre-Development Water Balance
(by MOE Method in "Hydrogeological Technical Information Requirements For Land Developmetn Applications", April 1995)

Pre-Development Infiltration Factors				Annual Evap (mm)	Annual Surplus (mm)	Annual Infiltration (mm)	Annual Runoff (mm)	Area (m^2)	Annual Infiltration (m^3/yr)
Topography	Soil	Cover	Sum of Factors						
Rolling to Hilly 0.15	Sand/Silt Loam 0.35	Cultivated & Grass Mix 0.15	0.65	548	369	240	129	36200	8683